ELECTRICAL REVIEW

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Post-war Trade

Creation of New Markets

BEFORE the war this country had reached a high standard of life, attributable in the main to our extensive export trade and to the income derived from overseas investments—two factors which were closely connected and which enabled us to import all kinds of necessities as well as goods which possibly we could have done without.

We were content to be mainly industrial, leaving other countries to supply the bulk of our food. No doubt if we had been self-feeding we should have been more independent, but we could not have employed all our population without depressing the standard of living to a very considerable extent.

Purchase of Raw Materials

To pay for the war we have had to realise the greater part of our external investments while to cut down imports the land has been intensively cultivated for the production of food. This latter development has led to the idea in some quarters that we should grow practically all our food in future. We will not attempt to pronounce upon the feasibility of this, but in any event this country must remain predominantly industrial, unable to obtain raw materials without paying for them in some way.

The only method of payment so far as can be seen at present is by exporting manufactured goods. We must still export to live and conditions will not be easy for exporters. Too many swords will be beaten into ploughshares and it will be difficult to find fields for all of them to operate in without overcrowding and cross-furrowing.

But there is a way out if we will take it. All over the world the useful arts and crafts have been restricted or suspended and people are in serious need of all the things which go to make the civilised life. The satisfaction of the need can give employment to all the industrial countries for a considerable time after the war but parallel with this there must be consideration of international trade arrangements in a more settled world, or, more truly, action to ensure a more settled world.

There are vast undeveloped countries whose populations merely exist miserably and others where the standard could be very much higher. Even the smallest improvement applied to the many millions of these people would represent a vast demand for all kinds of goods.

Electrification Prospects

One outstanding way of improving general conditions is electrification, as the governments of all these people recognise. Means must be found to assist in the realisation of electrification plans and in this matter British electrical manufacturers, as their record proves, are fully qualified to take a leading part.

These are matters to which much thought will have to be given and although our energies must at present be devoted to the winning of the war, some time must be spared for clearing the ground, if not for preparing plans.

The late Lord Hirst

THE British electrical manufacturing industry owes its position very largely to Lord Hirst, co-founder and pilot through fifty-four years of the General Electric Co., Ltd. Apart from his own abounding energy, perseverance and enterprise, he had the knack of picking the right men to work out his ideas and of encouraging them to develop their own. Many years ago he aimed at building up a strong independent electrical industry in this country and by his example he encouraged others to pursue the same ideal. The colossal many-sided business of the G.E.C. of which Lord Hirst was justly, but modestly, proud stands as his memorial.

Electrical Terms

WHATEVER one's views as to how far standardisation ought to go, there are not likely to be differences of opinion regarding the desirability of standard nomenclature. In other words the same technical expression should mean the same thing to everybody. Advances in science and technology require new terms and modification of existing definitions and provide warrant enough for the new edition of the British Standard Glossary of terms used in electrical engineering which the British Standards Institution is to issue in eight parts. The first part, now available, comprises Section 1 (General) of the 1936 edition, with additions and some necessary revisions. A new Section 7 is to be devoted to surges and lightning phenomena—a subject now wide enough to merit individual treatment.

Boiler Control

IT is logical to claim, as Messrs. G. H. Barker and A. L. Hancock did in the paper they read before the I.E.E. Measurements Section last Friday, that instruments installed for detecting defects should also be used to correct them. The chief question is whether resulting economies would recoup the added expenditure. Automatic control seems unlikely to increase notably the efficiencies of base-load stations. The least efficient stations dealing with peak loads would no doubt show a good return, but their running hours are few in the year and the useful life of the plant is probably limited. In between the two classes, however, there should be considerable scope for extended use of automatic systems, as it may be assumed that coal will be of a more consistent quality in the future.

Tolerances

CLOSELY connected with the present need to use standard products is the acceptance of as wide a departure as practicable from exact specified conditions. This applies especially to articles of which wide ranges are normally manufactured and stocked to meet small divergencies in requirements. A good illustration of the effect of allowing large tolerances is provided by the proposals for the standardisation of the ohmic values of composite resistors referred to in this issue—an example that might well be followed for many other products.

Re-graded Charge Engineers

REFERENCE was made in the *Electrical Review* of January 8th to the contention of supply authorities that the charge engineers in the larger power stations who had been raised from Grade 8 to Grade 7 of the N.J.B. schedule should receive the initial salary attached to the new grade without regard to their length of service. The matter was referred to the Industrial Court which has now decided, justly we think, that these engineers shall be paid the increments to which their service in the lower grade entitled them.

Overload Capacity

MOST electrical plant runs for a large part of the time at well below rated output, while the overload capacity is rarely touched. The new Direction of the Ministry of Supply that all further generators built shall comply with the provisions of B.S. 1084/1942, merely goes part of the way towards getting rid of this cause of waste of material, as the B.S. deals only with generators between 50 and 1,000 kW. These must now bear a definite ratio to the BHP of associated internal-combustion engines and have a continuous overload (current) rating of 10 per cent. The latter is a conservative allowance and should not shorten the life of the machine under ordinary operating conditions, although to do so would often be justifiable in present circumstances.

Factory Lighting

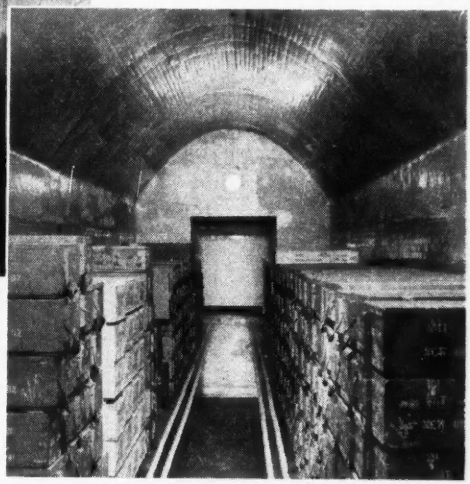
Features of a Very Large Installation

IN dealing with a lighting installation such as the one described in this article, by far the greater part of the matter must of necessity relate to the variations from common practice, so that to this extent the article is concerned with the leading features of a very large installation. We will not refer to it as "special" because, in the main, the illumination provided by this very large installation, embracing many thousands of lighting fittings, is effected by the use of standard and modified standard lighting equipment.

To facilitate presentation we have classified our references according to the types of illumination — general, low-intensity, flood, corridor, local and directional lighting—rather than to the types of fittings employed, but this classification is not in line with the principles of design of the installation, and there is consequently much overlapping. For instance, in many cases the type of illumination obtained is governed by the type of fitting which is permitted, this being dictated by the working conditions in various parts of the factory. Two other indirect but important features which have a bearing on various aspects of the installation and which should be borne in mind in considering the following notes are the smooth and round contours of the fittings which minimise the collection of dust, often explosive dust, and the light-colour painting of the walls of many of the rooms to provide the maximum reflectivity.

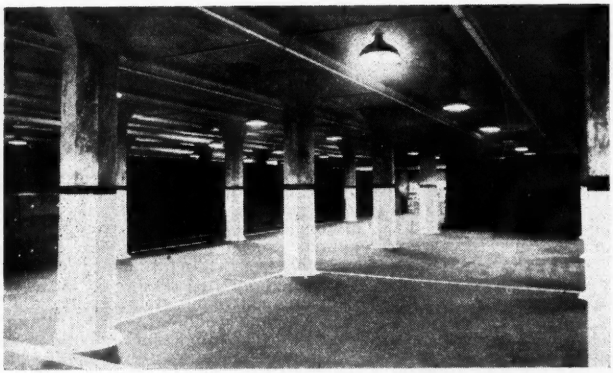
Although throughout the factory explosive conditions prevail in varying degrees, it is probably true that in the majority of places the conditions are similar to those encountered in industry generally. Such places include buildings used for storage, etc., in which no major operations are carried out other than, say, loading and unloading, engineering repair shops, boiler houses, substations and canteens, and the lighting in all these is perhaps the most common form of general lighting.

The type of fitting employed is a near approach to the normal industrial downlight fitting with a wide aperture at the bottom and a narrow neck at the top for the lamp-connecting devices. It is a dust-tight unit suitable for up to 150-W b.c. lamps, and it has a pressure die-cast dome and a one-piece "Crysteel" vitreous-enamelled steel reflector to provide the specified



Above: Within the limits set by the necessity of wall fixing the bulkhead fitting is suitable for corridor lighting Right: Each chamber is long and tunnel-like; a fairly high intensity of illumination is called for and the result approaches floodlighting

reflectivity. A steel cadmium-plated ring-type visor band is fitted with a moulded rubber gasket and a flat annealed plate-glass diffuser. Overlamp detachability is provided, so that by unscrewing the toggles the complete reflector part of the fitting is lowered, leaving just the lamp, lampholder and dome on the conduit box. The glass is about 18 in. in diameter. A similar unit has a domed annealed glass visor which gives sufficient internal depth to permit the use of a 200-W e.s. lampholder.

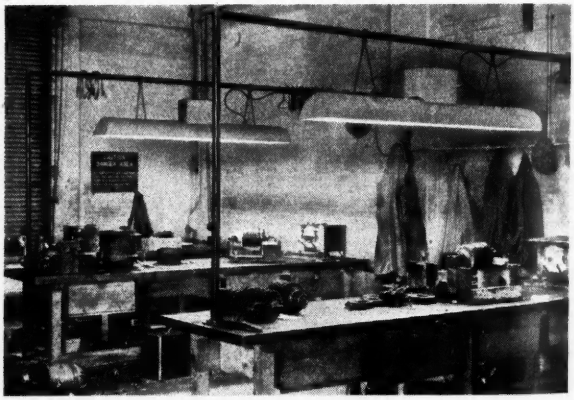


Medium or rather low intensity lighting is required in a storage chamber with low ceiling

Other places which may be reasonably included in the general lighting class are offices, changing and contraband rooms and small stores for non-explosive materials, and for these a dust-tight, well-glass and reflector type of fitting is employed. For use with up to 60-W lamps, it has a pressure die-cast dome, and a cast-aluminium-silicon grooved ring, with a moulded-rubber gasket, from which is suspended the "Armourlight" well-glass, and a 14-in. diameter R.L.M. dispersive reflector. A No. 18 SWG spun-steel vitreous-enamelled reflector surrounds the well-glass unit. "Straight" well-glass fittings, *i.e.*, fittings similar to the foregoing, but without the external reflector, are used in more confined places such as building porches, ablution rooms, motor and pump houses and indicator points.

In certain process shops, ingredient stores and buildings where a fairly high illumination intensity is required for major operations explosive conditions prevail, but the explosives are in stable form. To meet these conditions, lighting fittings similar to those used for general illumination in engineering repair shops, boiler houses, substations, etc., are used, *i.e.*, of the type approaching the normal industrial down-light fitting, with the wide bottom aperture and the narrow neck, except that the visor is of "Armourplate" glass instead of annealed glass. Lamps of up to 150 W are employed with these fittings with flat visors, while other fittings with domed "Armourlight" visors take 200-W e.s. lamps.

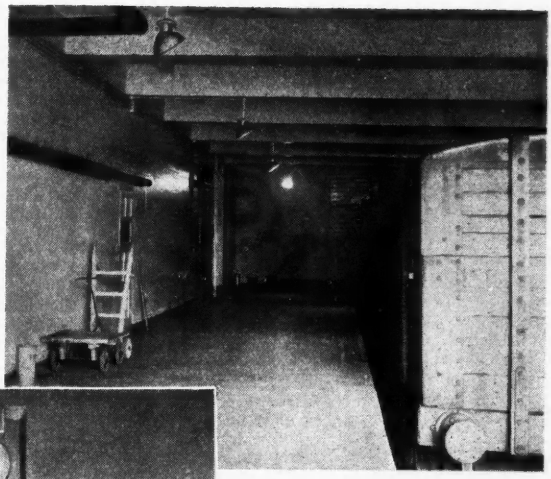
As the factory conditions become more exacting the choice of suitable fittings from the general-lighting viewpoint is limited by the necessity of employing equipment of flameproof construction, which indicates very clearly the bulkhead type of fitting. Even within this limited range further division is made necessary by the prevailing conditions.

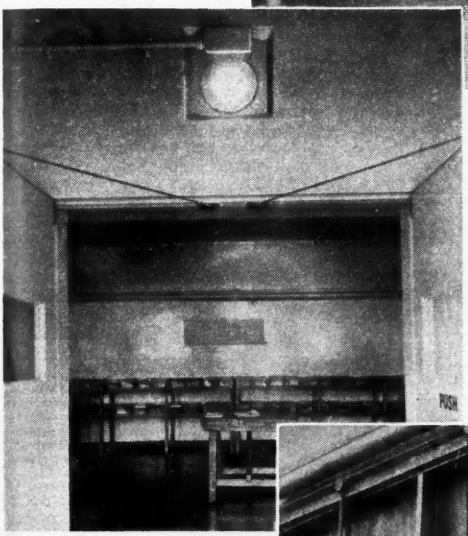


A high-intensity local-lighting scheme is employed in bench illumination by fluorescent fittings in the electrical repair shop

Whereas in some cases it is imperative that no electrical wiring, conduit, etc., should exist within the building or room to be illuminated, and likewise no electrical maintenance work may be effected in the room, in other cases, where flameproof fittings are essential, internal wiring is permitted.

Apart from restrictions imposed by the constructional features of the bulkhead fitting, the lighting problems are made more difficult when it is necessary to mount the fittings in or on walls instead of ceilings.



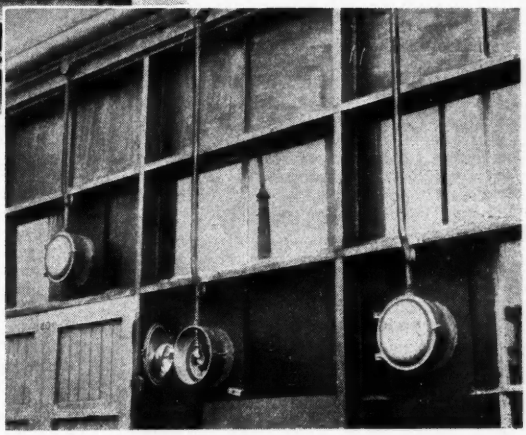


Above: A directional lighting problem is to illuminate the interior of wagons at a loading platform

Left: The main lamp illuminates the interior of a small process room and the smaller lens at the back lights the porch

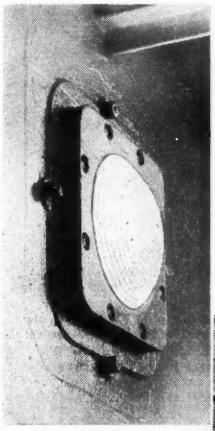
In spite of these difficulties, however, a very high standard of general illumination has been obtained.

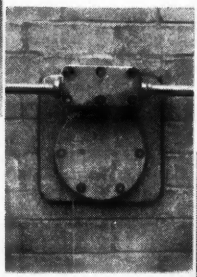
To keep the wiring, etc., out of the illuminated rooms, the wall-recessed type of flameproof bulkhead fitting is used, and there are various models of this to satisfy the differing lamp-size and wall-thickness requirements. One model designed for a 100/150-W lamp and a 12-in. wall has a cable-entry box and a detachable plate for lamp-changing at the back. It is 18½ in. from front to back and has a 17-in. square fixing plate at the face in which is fitted a circular domed prismatic glass. It has an internal reflector, while the front of an



Lighting in the horizontal plane is provided by swing-out fittings outside the window

internal connection box which is isolated from the main interior lamp chamber carries the lamp at an angle of about 45 deg. The complete fitting weighs 112 lb. A similar fitting for the same lamp sizes and with the same face dimensions measures 15½ in. from front to back, while another model for the same lamp sizes, but for a 4½-in. wall, has the lamp and reflector vertically disposed and measures 8¼ in. from front to back and 16½ in. by 15½ in. at the face. It weighs 47 lb.





Above: In order to keep the wiring, etc., out of the rooms wall-recessed flameproof bulkhead fittings are used

Right: The recessed bulkhead fitting has a cable-entry box and a detachable plate at the back

In places in the "flameproof" class where wiring is permitted in the lighted rooms, surface-type bulkhead fittings are employed, and again there are a number of different models for different lamp sizes.

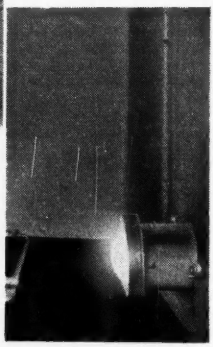
A rather popular general-service model takes a 100/150-W lamp, has a domed prismatic glass and measures 15¾ in. high and 9¼ in. in diameter. A 60/75-W lamp model is 14¾ in. high. Within the limits set by the necessity of wall fixing the bulkhead fitting is particularly suitable for corridor lighting, and in this connection we may mention the surface-type units employed to illuminate an adit to chambers for the bulk storage of explosives in stable condition.

Intensity Problems

In addition to the problems set by the need to use flameproof equipment and to keep wiring and maintenance work outside the rooms, there are others with regard to the shapes and structures of buildings and chambers which, of course, in common with all the problems, have to be considered in conjunction with the illumination intensity requirements. When all these problems are combined in any one case they resolve into something pretty acute, and an example of this is to be found in each of the bulk-storage chambers mentioned previously in connection with the adit lighting. Each chamber is long and tunnel-like, with a rounded roof and, as the bulk-storage of raw explosives awaiting shipment for process prohibits the use of internal wiring, and the building structure does not permit the use of the recessed type of fitting in the roof or along walls, each room has to be illuminated from the end walls by means of wall-recessed fittings. A fairly high intensity of illumination is also called for, and the result is something approaching flood-lighting, although, of course, not for mere wall-surface illumination.

The solution is found in the use of two high-candle-power lighting points, one at each end of the chamber, and wall-recessed externally connected and maintained flameproof bulkhead-type fittings are employed. Each of these fittings takes a 300-W lamp and has a circular dome glass. The greater overall depth from front to back of 22⅝ in. in this case is consequent on the use of the lamp in the horizontal position. The front fixing plate measures 17¼ in. square. There are a connection box at the back, projecting from the wall, and a detachable plate for lamp changing.

In a bulk-storage magazine for explosives as finished products in a fairly stable form medium or rather low intensity lighting is all that is called for to permit efficient handling and stacking, and internal wiring is permitted. The room in question is a very large one, but in relation to the floor or ceiling area it is low ceilinged. To meet these conditions the dust-tight industrial-type of fitting previously referred to in connection with the more normal general-lighting problems is employed, and each unit has an armour-glass visor and a dispersive reflector. Each fitting houses a fairly low-candle-power lamp, but the excellent lighting distribution is evidenced by the clear view of the mono-rail run-ways of the handling system on the ceiling.



A fitting low on the wall is in line with the operational plane of the equipment to give maximum definition in a series of mirrors

The provision of high-intensity local lighting calls for very special treatment in

some cases. We have particularly in mind in this case a small process room in which very highly explosive materials are dealt with by special equipment operated by a flexible drive and a series of remote feeds and controls. Observations of the operations are made remotely outside the room by means of a system of mirrors, and the high-intensity local-lighting problem is solved by a lighting fitting fixed very low on the wall, a few feet above floor level, in line with the operational plane of the equipment to give the maximum definition of the operating conditions in the mirrors. A secondary reason for the low-wall position of the fitting lies in the fact that the room has very thick and strongly reinforced walls and a light blow-off roof, so that in the event of an explosion the pressure is immediately relieved through the roof and the lighting fitting is not interfered with, as would certainly be the case if the fitting were mounted on the ceiling, and would possibly be the case if it were mounted high up on the wall. The fitting is of the flameproof bulkhead surface type already referred to, and it takes a 150-W lamp. Although the main problem in this case is the provision of high-intensity local lighting, the standard of general lighting is very good.

Another high-intensity local-lighting scheme which we saw is that devoted to bench illumination in the electrical repair workshops, where conditions permit the use of fluorescent lighting. Over each bench there is a 5-ft. 80-W tube within an inverted-trough opaque reflector, and the result is excellent illumination at the working plane with a reasonable degree of general lighting without glare.

Directional Lighting

Directional lighting is called for in several cases, in one of which the problem is to illuminate the interior of wagons drawn up at the loading and unloading platform of a bulk-storage magazine where the explosive is in stable form. The ceiling-suspended fittings are in character similar to the dust-tight industrial-type general lighting fittings already referred to, except that the reflector which carries the " Armourlight " glass is shaped to give directional lighting at about 45 deg., *i.e.*, into the wagons. Each fitting houses a 60-W lamp.

Another directional lighting scheme is for the illumination of rooms in which the process work is of such a highly dangerous character that not even the lighting fittings, let alone the wiring, etc., are permitted within the room. Large blow-out windows occupy one side of the room, and lighting in the horizontal plane is provided by fittings outside the window. They are suspended from a conduit run over the window and are so arranged that, in the event of an explosion, each fitting is directed away from the seat of the explosion by a swivel arrangement at the tee connection at the conduit. The fittings are of the dust-tight type and carry 60- to 100-W lamps. A front glass is of the dome prismatic type, while the hinged back door of the fitting carries a parabolic reflector.

Two-way fittings may be described as directional in a limited sense. They are of the flameproof recessed type already referred to, but they each have an additional smaller lens at the back and an additional 60-W lamp operating in conjunction with this. The main 150-W lamp is angularly disposed with a separate reflector, as in the case of the single-lens fittings. The main lamp illuminates the interior of a small process room in which interior wiring is not permitted, while the smaller lens at the other side of the wall illuminates the porch which serves as a sort of clearing house for materials passed into or out of the process room. The connections are on the porch side, where the back face serves as the detachable door and for maintenance.

Length-Change Recorder

A DILATOMETER for making permanent records of changes of length of the order of 0·001 mm. in steel specimens is described in a paper (No. 7/1942 of the Alloy Steels Research Committee) by Mr. L. R. Stanton (University of Manchester) issued by the Iron and Steel Institute.

The essential principle of the method, suggested by Professor F. C. Thompson, is utilisation of changes in length of the metal specimen undergoing heat treatment for altering the distance apart of the two plates of an electrical condenser, which is employed for tuning an inductance at its resonant frequency, thus causing a steep rise and decline of the induced current for small changes in capacity.

Details of the electrical circuit are included in the paper. A pentode screened-grid valve is used as an oscillator, the frequency being controlled by a quartz oscillator. The oscillatory output is taken from a few turns made in the anode lead, to which the inductance coil is very loosely coupled. It is imperative that as little load as possible should be put on the coil output; therefore it is taken from a tapping from the inductance of only a few turns and applied to the anode of a rectifying valve arranged to work as a modified Moullin valve voltmeter. After passing a filter circuit consisting of a choke and condenser, the rectified current flows through a potentiometer and is then applied to a potentiometer-type Kent recorder, giving records every two seconds.

Capacity-change dilatometers often employ a cathode-ray tube oscilloscope as the indicator in a null circuit, but a recording galvanometer has important advantages which at least compensate for possibly slightly less sensitivity. While the cathode-ray method fulfils more completely the requirement that load shall not be imposed on the resonant circuit, it is practically impossible to take readings by this means sufficiently often and accurately to show what is happening during the critical changes that occur when investigating austempering of steels.

Lord Hirst of Witton

A Captain of Electrical Industry

ELECTRICAL men in all branches of the industry will have heard with deep regret of the death, on January 22nd, of Lord Hirst of Witton, Chairman of the General Electric Co., Ltd., in his 80th year.

Hugo Hirst was born in 1863 and came to this country as a boy, working for a time with the Electrical Power Storage Co. He commenced the sale of electrical accessories and in 1889 in conjunction with George and Max Byng established the General Electric Co. with premises in Queen Victoria Street, E.C.4. He became managing director in 1900 and chairman in 1910. By the hard work of Hirst and his colleagues the business was rapidly expanded and extended into various fields until to-day it can boast of producing "everything electrical," having a capital of about £8,000,000 and employing over 50,000 people.

The late Lord Hirst

But apart from G.E.C. affairs, Lord Hirst had a good record of service for the electrical industry generally and for the nation. He had been a member of many commissions and committees. One of his most notable tasks was as a member of the Commission which went to Australia in 1928 to discuss with the Commonwealth economic relations between Great Britain and Australia. After this mission he held the view that the best interests of the Commonwealth lay in the development of its primary resources with Great Britain as principal customer, while the provision of manufactured goods was left largely to this country.

He served on the League of Nations Sub-Committee of Experts for Scientific Property and his other national activities included membership of the Cabinet Trade and Employment Panel, the Advisory Committee of the Board of Trade, the Committee on Unemployment Insurance (1925-26) and the Committee on Co-operative Selling in the Coal Industry (1926).

Lord Hirst took an active part in the Melchett-Turner Conference on industrial relations and served as president of the Federation of British Industries in 1936-38, having acted for some years as chairman of the F.B.I.'s Empire Committee. He had also been president of the Radio Manufacturers' Association, of the Association of Technical Institutions, the Institute of Fuel (of which he was one of the founders), the British Export Society, the British Electrical Development Association and, on two occasions, of the Electrical Industries Benevolent Association, of which he was a senior warden.

His services to the electrical industry and profession were recognised by the Institution of Electrical Engineers by his election as an honorary member. Last year he presented a sum of £20,000 to the I.E.E. for the purpose of establishing the "Lord Hirst Fund" for charitable purposes connected with the Institution. Probably his last public service was his appeal for support of the Electrical Industries Red Cross Fund of which he was chairman.

Lord Hirst always took a personal and practical interest in the welfare of his company's many employees and provided recreational facilities on a generous scale an expression no doubt of his keen sportsmanship. One of his horses, "Diolite," achieved prominence by winning the Two Thousand Guineas in 1930.

He was convinced of the importance of scientific research in industry and the G.E.C. Research Laboratories are the outstanding result. At his home at Fox Hill, near Reading, he carried out many experiments in scientific farming.

Hirst was made a baronet in 1925 and was raised to the peerage as Baron Hirst of Witton in 1934. He married in 1892; Lady Hirst died in 1938. They had one son and two daughters. The son, Harold Hugh, had a commission in the Manchester Regiment, and died in February, 1919, leaving a son (Harold Hugh) and a daughter (Pamela). It was a great grief to Lord Hirst that his grandson, Harold Hugh, was killed on active service in 1941 while with the Royal Air Force.

Lord Hirst's elder daughter is the wife of Mr. Leslie Gamage, joint general manager, with Dr. A. H. Railing, of the G.E.C. His younger daughter is the Hon. Mrs. Trevor Rose.

A memorial service to Lord Hirst was held at St. Martin-in-the-Fields on Wednesday last.

Fuses *v.* Oil Circuit-Breakers

Their Spheres in Medium-Voltage AC Industrial Installations

By G. Cluley, M.I.E.E.

IMPROVEMENTS in design and performance of cartridge fuses in recent years have led to their increasing use, and the industry has benefited from research work which has resulted in a greatly improved breaking-capacity performance. Ability to interrupt heavy short-circuits has tended to overshadow other equally important objectives; safety devices should protect the apparatus adequately and minimise the disturbance to the system as a whole.

Assistance is afforded intended users in deciding where fuses can be used with safety, as an alternative to the more expensive heavy breaking duty circuit-breaker, or as a "back-up" to a low breaking duty industrial circuit-breaker; the subject is dealt with under five headings

Whilst this article primarily applies to industrial installations, where there is a step-down transformer on the premises and where the short-circuit current is of a high order, the requirements for earth-fault protection apply also to rural and domestic applications, in which the maximum size of fuse should be governed by the amount of earth-fault current which can flow.

(1) Protection Against Earth-Faults and System Earthing

The necessity for providing earth-fault protection on a medium-voltage AC system is now generally accepted, because on such systems one point has a direct connection to earth, *viz.*, the neutral point on the secondary side of the step-down transformer. A failure of insulation on a normally insulated conductor will cause current to flow *via* the neutral point. The magnitude of this current is dependent upon the impedance of the circuit.

The I.E.E. Regulations for the Electrical Equipment of Buildings (June, 1939) require that "earth leakage protection shall be provided in all installations and shall be capable of disconnecting the live conductors." Installations where the current rating of the fuse or circuit-breaker controlling the circuit does not exceed 100 A and the metalwork of the installation is earthed are exempted.

The report of the Committee on the Amendment of the General Regulations Governing the use of Electricity in Mines (1941) includes the following under Section VII—24 :—

> "We propose that earth-leakage protection shall be obligatory for all alternating current circuits above and below ground if the voltage exceeds 125 volts.
>
> "It shall be such as to bring about the automatic isolation of any circuit in which a leakage to earth occurs exceeding 15 per cent. of the rated current of the circuit or 5 amperes, whichever is the greater."

The foregoing reference to comparatively recent documents shows that earth-fault protection is prominently in the minds of any body of engineers who may be deputed to make recommendations for the safety of the public.

Previous reference has been made to the practice of earthing the neutral point on the lower voltage side of a step-down transformer. The requirements in this respect are clearly defined in the Electricity Supply Regulations, 1937. System earthing has necessitated a very careful study of methods of bonding and earthing metalwork, such as apparatus casings, building structures and cable armouring, since a failure of insulation should cause sufficient current to flow to operate the protective devices.

It should be the general practice on a medium-voltage AC installation to bond all ironwork, cable armouring and the transformer neutral to a common earth point. This should be a water main if one be located conveniently, failing which a special earth plate must be buried. Pipes driven into the soil are a useful alternative. In good ground a water-main earth will have a resistance of about half an ohm, and a specially sunk plate of about one ohm. Continuity of bonding cannot be guaranteed throughout the system to the extent that the resistance to the flow of earth-fault current is negligible, or that fault current will always pass through the bonded circuit. If the fault current has to pass *via* the earth plate on a 400-V three-phase system, such current would be limited to 230 or 460 A, according to the method of earthing.*

(2) Characteristics of High-breaking-capacity Fuses

All types of fuses inherently have an inverse time-current characteristic, which renders them admirably suitable for short-circuit protection. Against ordinary overloading, however, they do not give the same degree

* For further information on the subject see "Practical Aspects of Earthing," by E. Fawssett, H. W. Grimmitt, G. F. Shotter and H. G. Taylor, *I.E.E. Journal*, October, 1940.

of protection as circuit-breakers, because there is a minimum fusing current which can be chosen in order to maintain stability of the fuse on normal load. Different formations of fusible element have been adopted by certain manufacturers with a view to achieving a fusing current nearer to the normal rating, but these have little effect on the shape of the curve during the period of 0 to 60 seconds operating time.

The characteristic curves for a well-known make of high-breaking - capacity fuse, from 50–200 A normal ratings, are shown in fig. 1.

The fuse elements are designed to operate at approximately 200 per cent. of normal full-load current in one hour, and 300 per cent. in 30 seconds. This high minimum fusing is for reasons of stability, since, if a lower fusing current were allowed, the normal-load temperature of the fuse would be such as to cause deterioration of the element and lead to a marked alteration in the current-time curve.

When a fuse operates on short-circuit, it isolates the circuit very quickly as compared with a circuit - breaker. The rapid growth of current increases the temperature of the fusing element and melting point is reached in considerably less than ¼ cycle. Since it takes from ¼ to ½ cycle (according to the degree of asymmetry of the wave) for the short-circuit current to attain its peak value, it follows that the fuse will interrupt the current before it has time to rise to its maximum value. Furthermore, the rise in temperature of the fuse element increases its resistance and limits the rate of rise of the fault current. The current interrupted by the fuse is, therefore, much smaller than that which would flow in the circuit if the fuse were replaced by a link of negligible resistance.

The latter current is termed the " prospective current " (see B.S. 88–1939). The current-limiting effect of a fuse is of considerable value when it is used for the purpose of safeguarding apparatus which is not capable of withstanding the electro-dynamic stresses resulting from the " prospective " current.

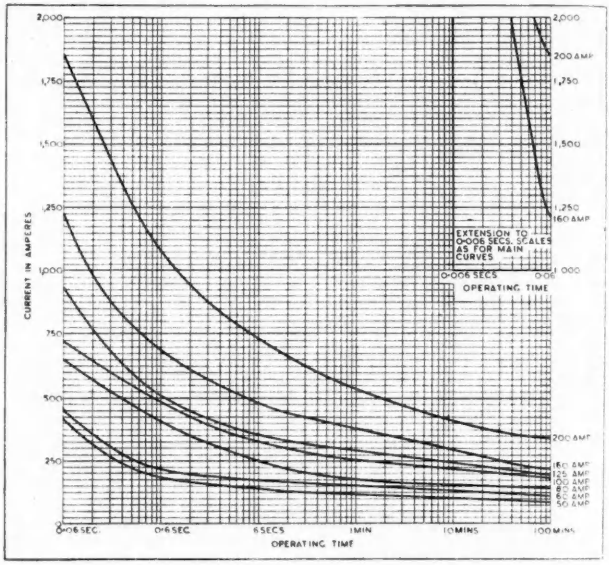


Fig. 1.—Characteristic curves for high-breaking-capacity fuse

(3) Characteristics of Circuit-breakers

Although some circuit-breakers do limit the short-circuit current to some extent, the majority of designs do not. In these the inherent time-lag of the breaker mechanism, of several cycles duration, allows the fault current to rise to a maximum. Consequently, the circuit-breaker and associated apparatus have to withstand the full electro-dynamic effects.

Circuit-breakers, by the agency of trip coils directly connected to the mechanism and of relays for overcurrent and earth-fault protection, can be set to operate within practicable limits at any predetermined value of current and time. This enables them to afford adequate protection against overloading and yet permit the starting of motors taking four to six times normal full-load current for the time necessary to get the motors up to speed.

(4) Back-up Protection

Fuses are often used in conjunction with small motor-control equipments, which include oil circuit-breakers or contactors, in order to provide adequate short-circuit protection and to limit the magnitude of the peak current to a value which such apparatus

can withstand from the electro-dynamic standpoint. Fuses can also be added to existing circuit-breaker equipments where, due to extensions, the short-circuit conditions have outgrown the capacity of the existing breakers.

With such arrangements normal overload and earth-fault protection is provided on the circuit-breakers, or by relays arranged to open-circuit the hold-on coils of the contactors. There are definite limitations to this form of application of high-breaking-capacity fuses, since the duty of the fuse is to safeguard the associated apparatus from the effects of the fault current.

The actual peak value of fault current on a fuse-protected circuit is definitely controlled by the size of the fusible element. The larger the fuse, the greater will be the magnitude of the peak current. It follows, therefore, that there is a maximum size of fuse which can be used with any given circuit-breaker or other apparatus to protect it from damage.

The prospective-current curve* of a fully asymmetric wave corresponding to 35,000 A RMS (*i.e.*, a little over 25 MVA at 440 V) shown in fig. 2 was prepared to show the level at which cartridge fuses of different normal-current ratings between 30 and 400 A cut off the current before the prospective current is reached. It will be seen that a fuse having a normal current rating of 100A will cut off the current when it reaches a value of approximately 12,000-A peak, and any circuit-breaker or contactor connected in series with such a size of fuse must be capable of withstanding the stresses consequent upon this value of current peak.

(5) Fuses in Sub-circuits

In many instances fuses alone, or fuses with knife-switches, are provided for the control of power circuits, either as single units or in groups as a distribution switch-fuse board. Such a form of protection provides only for phase-to-phase faults when the fuses are for, say, 100 A and upwards. Over-currents of 50 to 100 per cent. or an earth-fault could persist until major damage to the apparatus had occurred such as would cause a fault between phases and blow the fuse. Pure over-current can be prevented, in most cases, by control of the load, but there will always be cases where it will be necessary to provide circuit-breakers with over-current or thermal attachments in order to give the desired protection. A method of giving non-discriminating earth-fault protection to a group of circuits would be to provide a master circuit-breaker controlling a group of fuse circuits. The master circuit-breaker could be provided with sensitive earth-fault release, so that in the event of an earth-fault on any circuit the whole could be isolated.

* From "British Standard Specifications and Switchgear Practice," by A. J. Nicholas and S. Farrer. Paper read before Manchester Technical Group, E.P.E.A., March, 1940.

Conclusions

(*a*) The I.E.E. Wiring Regulations and the Mining Regulations are very definite in their requirements for earth-fault protection. The desirability of earth-fault protection on medium-voltage systems having the neutral earthed is beyond question. Due to the impedance of the earth path, earth-fault currents are limited in magnitude and fuses exceeding 150 A normal rating cannot be

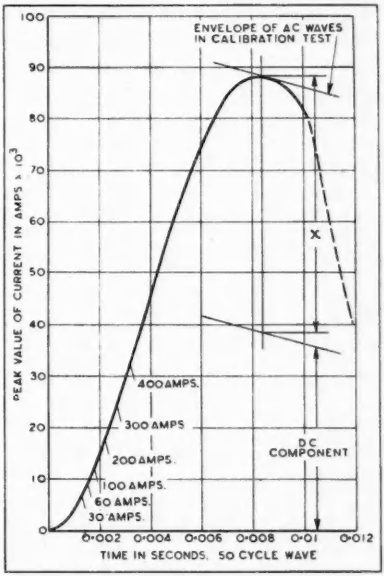


Fig. 2.—Diagram showing level at which cartridge fuses of different normal ratings from 30 to 400 A cut off the current in a fully asymmetric prospective current wave

(Fully asymmetric wave AC component $= \frac{X}{\sqrt{2}} =$ 35 kA, corresponding to 27 MVA at 440 V)

expected to give earth-fault protection on a medium-voltage system.

(*b*) Fuses for the protection of motor circuits have to be selected according to the starting characteristics of the motor. For "direct-on" started motors, fuse elements must be selected for approximately twice the normal-load current to obtain stability under starting conditions. Consequently, fuses cannot be considered satisfactory for "direct-on" started motors of normal-load current exceeding, say, 75 A.

(*c*) When fuses are used as back-up protection to small-breaking-duty industrial circuit-breakers or contactors, the peak current admitted by the fuse must not approach a value at which damage is likely to be caused to the circuit-breaker, or contactor.

Short-circuit tests can be made to prove the suitability or otherwise of any combination of fuse and circuit-breaker and, in the absence of such test, I suggest that fuses above 200 A should not be used for back-up protection where there is any doubt as to the ability of the associated apparatus to withstand the peak current admitted by the fuse.

B.S. Electrical Glossary

Revision in Eight Parts

AT the outbreak of war a revision of the B.S. Glossary of Terms used in Electrical Engineering (B.S. 205) was in hand, partly in connection with proposals by the British Standards Institution for the revision of the International Vocabulary published by the International Electro-technical Commission. Work on the latter was perforce suspended, but it was decided to proceed with the revision of the British Standard Glossary, particularly as it was by this time out of print and the type had been lost by enemy action. Although all the co-operating experts have been fully engaged on war work, yet with the active support of the Electrical Research Association, a stage has been reached where publication of the revision in sections can begin. In view of present conditions the main portion of the work will be issued at short intervals in eight parts at 2s. each, post free.

Terms relating to telecommunication which were given in Sections 9 and 10 of the 1936 Edition will be issued separately as a revision of B.S. 204.

In the new edition the former Subsection 13 (Units) becomes 14, and the terms are numbered from 1401 instead of from 1301. The numbering in later subsections is advanced accordingly. The alteration appears to be due to the number of terms in Subsection 12 (Fundamental Electric and Magnetic Terms) having exceeded the hundred allotted to each subsection, the surplus being numbered from 1301.

Standard Resistance Values

Manufacturers and Government Decision

COMPOSITE resistors now cover an uneconomic range of about 800 different values between 10 ohms and 10 megohms. Usually, the resistance value is indicated on the body of the resistor by means of coloured bands or spots. In order to facilitate manufacture and reduce the amount of inspection and testing now necessary and to obviate the need for holding large assorted stocks, a measure of standardisation of fixed-composition resistances, of all types except the wire-wound, has been decided upon by the Government's technical departments and the Inter-Service Components Manufacturers' Council, which has the backing of the R.M.A., the telephone industry and the composite-resistor manufacturers.

The basis of this standardisation is that resistors are not made to the exact value but to within a specified tolerance; viz. ±5, 10 or 20 per cent. Thus, a 100-Ω resistor with ±20 per cent. tolerance could be used for all values from 80 to 120Ω. The whole resistance range can be divided into 255 consecutive value groups, covering all their tolerances, the width of each group corresponding to these tolerances. For example, 10, 12 and 15Ω have corresponding ranges, with ± 10 per cent. tolerance, of 9 to 11, 10·8 to 13·2 and 13·5 to 16·5. If the tolerance be increased to ± 20 per cent., 10Ω would cover from 8 to 12 and 15Ω from 12 to 18, thus eliminating the 12-Ω range. In this way the whole range from 10Ω to 10 MΩ can be covered, and the colour coding given to each range can be standardised.

It follows that, wherever possible, a tolerance of 20 per cent. should be allowed. A tolerance of 5 per cent. should be called for only in special cases under sanction from the appropriate Government Supply Department. While the new standards cannot be applied immediately to existing equipment, the change over should be effected as soon as possible. A quick-reference chart showing how to apply the standard values is in preparation and will be available at 3d. from fixed-resistor manufacturers.

Fuel *v.* Hydro Power

The Trend in America

ADDRESSING a gathering of 400 engineers at South Bend, Ind., recently, Mr. P. Sporn, vice-president of the American Gas and Electric Service Corporation, predicted that power generation in the United States would be chiefly by fuel, probably coal, for several hundred years to come.

He pointed out that in spite of the important hydro-electric development in recent years the proportion of hydro-generated energy had materially declined. About 270,000 million kWh could be generated annually by hydro-electric means, and of this most of the economic developments had already been pre-empted.

With regard to steam stations, the quantity of coal per kWh had been reduced from 10 lb. at the time of Edison's Pearl Street station to 0·8 lb. the figure for the 2,400 lb. per sq. in. steam-electric generating unit at the Twin Branch station of the Indiana & Michigan Electric Co.

Great as had been the technical progress in high-voltage transmission over long distances—he expressed confidence that lines could be built to operate safely at voltages up to 345,000—the economic limits as prescribed by losses were definite, and he felt that such transmission over long distances could not compete economically with the transmission of energy by freight, in the form of coal.

Turning to distribution questions, Mr. Sporn looked to the electric heat pump to carry electric heating into the home on a large scale. Some dozen applications of the heat pump were in operation in various parts of the A.G.E. system, he said, but development of a cheap pump, within the reach of the average man, must wait until after the war.

CORRESPONDENCE

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for correspondents' opinions.

Dust-proof Joints

IN a leaderette in your issue of January 8th you refer to the use of flameproof gear for magnesium grinding. You say that it is proposed to treat the flange joints with grease to exclude dust. We recently had a case of a portable hand lamp of the proper Buxton type which blew to pieces, fortunately after it had been removed from a location of great danger in a gas works. The glass had completely gone and also the guard, but the metal casting was complete, so we opened the flange joint. We found a film of oil between the machined flanges, which in our opinion defeated the object of having a gap between the flanges which acts as a long cooling path for any internal ignition of gas.

There was no corrosion worth mentioning round the flanges of the fitting and the joint separated immediately the bolts were released. The cause of the ignition is immaterial, but it might have been due to a defective point contact at the lamp owing to the lampholder spring being weakened by heat. We assume that the oil got between the flanges due to alternate heating and cooling of the lamp drawing fresh oil-laden air into the glass or bulb chamber and leaving the oil in the air deposited on the flanges. This would be a slow process, but we think that the deposited oil would form an effective buffer against the sudden passage of air due to the internal ignition of gas.

With this experience fresh in our minds, we regard the suggested treatment of flange joints with grease as a step open to question. We should suggest that, as gas is not involved at all, the first consideration is to keep ignitable dust out of the lamp chamber and that the accepted principle of flameproof fittings does not apply in this case. Something more reliable than grease is therefore required and asbestos packing seems to be indicated.

Leeds. D. M. FRASER, A.M.I.E.E.

The Step-up Tariff

WHILST all tariffs are deficient in some respects, I think that Mr. Bolton is in error when he states that the modified step-up tariff, which I put forward for discussion, fails to correspond either to value or to cost. Mr. Bolton's example is not as happy a one as he usually chooses and has, I think, a boomerang effect. As the households are similar they would, I believe, under his suggestion have the same fixed charge—or number of kWh at 4d.—and the same running charge of ½d. On the two-part tariff the additional cost of either the 200th or 1,000th kWh to the consumer is ½d. (and is likely to be the same under the block tariff), yet, as Mr. Bolton points out, the "value" is not the same.

In the modified step-up rate the 200th kWh would, for houses with more than three rooms, cost the consumer 4d. The 1,000-kWh household would, in order to reach this consumption, have installed and declared, say, a cooker. Thus assuming average summer use, the 1,000th kWh would cost the consumer 0·85d.

Then as regards costs, on the two-part and block rates both households pay the same fixed charge and thus rent the same proportion of the generation and distribution system. Yet in order to use 1,000 kWh per annum the second household would, almost of necessity, have installed some apparatus such as a cooker, fire, or water heater. Unless the demand of this apparatus is entirely off peak—and perhaps not even then—it is not correct from a costs point of view to have the same fixed charge unless the running charge includes a large part of the fixed charges of the undertaking—which at ½d. it can't. Under the modified step-up rate the 1,000-kWh household would, if a cooker were installed, contribute up to about 1·5 times as much to the fixed charges as the 200-kWh household.

The attractive point about the modified step-up tariff is the way in which, by altering the size of the blocks, a rough and ready reflection of value and cost can be obtained and for this reason I think it also warrants consideration for post-war use.

Ringwood, Hants. R. B. ROWSON.

Zoned Tariffs

MR. F. S. Naylor's article in your issue of January 22nd, rightly brings to notice the fundamental characteristic of any good tariff—at least with respect to the conditions under which we live and have lived since the inception of public electricity supplies.

The theme "to charge what the traffic can bear" will continue to have an important bearing on the development of electric power supply unless, of course, we change our system of commercial dealing.

Standardisation of tariffs for all consumers would lead to some parts of the country being deprived of certain industries which in turn would react at some future date to the disadvantage of the nation. It should be remembered that the centres of population which suffered most during the last slump

were those depending on one specific industry, *e.g.*, shipbuilding, steel, cotton, wool, etc. Unless the Government takes things in hand, similar circumstances will arise some years after the conclusion of the present conflict. Electric power supply is the backbone of the nation's productive power and every endeavour should be made to facilitate its development.

Shipley. T. H. CARR, A.M.Inst.C.E.

Maintenance Problems

AS one in a similar position to that of Mr. H. Yeomans, whose article appeared in your issue of January 15th, I can sympathise most heartily with him over some of his difficulties, most of which, as he points out, would be non-existent if a little forethought had been exercised. Memories of some very harassing occasions when trying to locate blown fuses in some very old and complicated installations have prompted me to evolve the system described below.

All fixed plant or machines required to be locally fused are fitted with a suitable fuse fitting mounted on the switch or casing, whilst socket outlets, etc., have the same type of fuse mounted on an ordinary box cover in the conduit run. This enables, say, a machine light to be picked up from one phase of a motor circuit by merely adding a neutral and looping one phase at the fuse. Any room with more than one light is fed by at least two circuits. All single-phase circuits are fused on one pole only.

Every fuseboard is numbered and every switch, socket-outlet or motor isolator in the installation bears a tag showing the number of the fuseboard feeding it, the "way" number and, in the case of single-phase supplies from a three-phase and neutral board, the phase colour. Red is always the top bank, yellow the middle and blue the bottom.

To give an example :—57/7 would mean No. 7 way on 57 fuseboard, whilst 63/5/Y would indicate No. 5 way on the middle bank of 63 board. The tags consist of bits of sheet metal about 1 in. by ½ in. stamped by hand with the usual number or letter punches, and fixed to the conduit by an ordinary earth clip. All DC fuseboards bear a letter instead of a number and all conduit carrying DC cables is painted a distinctive colour.

At prominent positions throughout the factory are stations consisting of :—(1) a glass-fronted cabinet containing spare cartridges and fuse wire ; (2) a pair of steps ; (3) a battery hand-lamp. (These items are secured by the standard lock common to all electrical equipment for which all the electrical staff carry a key. At the stations are also a plan of the building with all fuseboard positions clearly indicated (including switchgear) and a schematic distribution layout showing interconnections of all subboards, main boards, switch panels, etc., right back to the main breaker.

All fuseboards have a clearly marked chart showing whence they are supplied, and the points and load protected by each fuse with all circuits containing clocks or other apparatus which should not be stopped marked in red. In order to identify points controlled by multi-gang switches, these switches are individually numbered and the switch number quoted on the fuseboard chart. Where the numbering of the switches themselves presents difficulties, a sketch of the switchbox is made at the bottom of the chart and the numbers are marked in. The useless little bit of paper supplied by the fuseboard manufacturers is replaced by a piece of card large enough to cover the interior of the fuseboard door.

This system has proved well worth the trouble taken. A strange electrician or semi-skilled man can correctly replace a blown fuse in a matter of seconds, and find his way about the installation without having to ask "the man who put it in." One man should be made responsible for checking and re-charting any alterations or extensions and for keeping the numbering, etc., up to date.

High Wycombe. B. RAYNOR.

Advertising in Wartime

A TIRADE has recently been printed in the "Oxford Bulletin of Statistics" regarding the alleged waste of paper in trade and technical Press advertising. "Prestige advertising" is particularly mentioned and it is suggested that its paper should be turned over to the book trade which could put it to much better use.

This matter had also attracted my attention, but I did not view it from the same angle as the Bulletin. I made a careful study of over 40 journals of the trade and technical Press and I found that from 75 to 80 per cent. of the advertisements in them were "prestige" or "reminder" advertisements. The restrictions on print, paper and circularising force us to make the maximum use of our trade Press. The days of sales campaigns have gone with the fractional quotas now allowed and the priority numbers necessary before any delivery can be quoted, and this means a complete change in our methods of advertising. The trade Press is now the principal means of contact between the manufacturer and his clients.

The elimination of circularising and direct mail means that the folders and catalogues that used to be the means of disseminating information should now be transferred to the trade Press where pages are "decorated" with name plates and useless photomontage when they should be used to convey a message of some new design or alteration or some service information that would be of real

service to an overworked maintenance man.

Such a campaign will call for the technical experts in the various firms to write some good "copy" or to supervise the information. The lay-out of the matter comes under the control of the advertising agent who will put it in as neat a form as possible.

Bromley, Kent. M. C. TONER.

Checking Calculations

YOUR readers may be interested in a method of checking calculations involving multiplication which I was recently shown. There may be nothing new in it, but in these days of staff shortage it may be worth setting out with a view to saving the time of persons engaged in making numerous calculations of this type. It can be used only for checking the correctness or otherwise of the answer, but has the merit of being quicker and less fatiguing than travelling over the original calculation a second time, with the possibility of repeating an error.

The following example should make the method clear. Suppose we wish to multiply 973,582 by 85,631, we find the answer is 83,368,800,242. To check we add the numerals in the first number together, which total 34, and then add these again until we get a single figure, which in this case is 7. We treat the multiplier similarly and get 23 and then 5. We deal similarly with the original answer, and find this to be 44 and then 8. Finally, multiply the first two answers obtained, *i.e.*, $5 \times 7 = 35$; adding as before we get 8. Thus the four figures obtained are 7, 5, 8 and 8, and if the last two final figures, which in this case are 8 and 8, are the same, then the answer is correct.

*London, S.W.*1. A. E. NORRIS.

H.R.C. Fuses

I WAS very interested to read in your issue of January 15th, Mr. J. W. Gibson's letter on my article drawing a comparison between the performance of high-rupturing-capacity fuses on DC and AC circuits, and would confirm my agreement with his theoretical consideration of the problem. Results I have available dealing with the performance of fuses under AC test conditions show that the cut-off current of twenty-five fuses rated between 200 and 400 A, averages sixty-six times full-load current with a minimum of forty-five and a maximum of eighty-six times the full-load current, when tested in a 440-V circuit with 33,000 prospective amperes and power factor 0·3.

These results indicate that the probability of a h.r.c. fuse having to deal with currents as high as one hundred times the working current must be the exception rather than the rule. Possibly with fuses rated lower than 200 A proportionally higher cut-off current may have to be dealt with as appears to be the case with the DC tests.

Mr. Gibson's suggestion to plot the ratio of the fuse ratings rather than the difference is sound, but the graph as it is shown was thought to possess the advantage of simplicity of interpretation, particularly when considered in conjunction with the remarks made in paragraph five of the article.

Fig. 5 was drawn from the information given in Table 1 (not Table 2 as indicated in the article) and it will be noted that throughout the major part of the range covered by the graph the cable inductance is, for all practical purposes, constant irrespective of conducting area.

As a result of Mr. Gibson's letter, I am tempted to suggest that it would be extremely useful if some authority could publish practical data relating to the discriminative properties of h.r.c. fuses in AC circuits.

Isleworth. S. H. FOWLES.

DC to AC Changeover

A SUPPLY undertaking has installed in the premises of one of our customers a mercury-arc rectifier to supply the existing DC load, as an alternative to changing over all the existing DC plant to AC. It was fitted by the company free of cost to the consumer, who however provided the necessary room.

The rectifier is installed on the consumer's side of the meter. Should not the rectifier have been fitted so that the DC output (and not the AC input) was metered? As the matter stands now the consumer has to pay for all losses which, in our opinion, will be considerable over a year as the rectifier is in circuit for seven days a week, twenty-four hours per day. We should welcome your readers' views. R. B. WILSON, LTD.

Belfast. (G. A. WILSON).

[This letter raises an interesting point. The Commissioners' conditions in giving consent to changes of system require undertakers to bear the cost of the necessary alterations to consumers' installations to suit the change-over or pay an agreed sum instead. There appears to be nothing governing subsequent operation. In the absence of any agreement regarding the position of a rectifier it would appear necessary to resort to arbitration in the event of a dispute.—*Eds. Electrical Review.*]

Latex Sleeving

E. Siegrist, Ltd., 39, Berners Street, London, W.1, announce the introduction of latex sleeves for binding, marking and insulating electric wires. The sleeves can be made with a wall thickness of from $\frac{1}{4}$ mm. to 3 mm. and two sizes replace, with better results it is claimed, the six sizes of extruded rubber sleeves previously employed. Latex sleeves of 3 mm. bore can be stretched over cables of $\frac{7}{8}$ in. diameter.

Scottish Water Power

Details of New Bill

DESIGNED to implement the main recommendations of the Report of the Cooper Committee,* the Hydro-Electric Development (Scotland) Bill received its first reading in the House of Commons last week. The Bill provides for the setting up of a public service corporation, called "The North of Scotland Hydro-Electric Board," of five members (one of whom is to be a member of the Central Electricity Board) who will be appointed jointly by the Secretary of State for Scotland and the Minister of Fuel and Power.

The duty of the new body will be to undertake all further generation of electricity within a delimited "North of Scotland District," and no other person or body may establish a generating station of more than 50 kW or extend an existing station by more than 50 kW. The Board, which is defined as an "authorised undertaking," will supply other authorised undertakings, large power users (*i.e.*, those with demands of 5,000 kW or more) and ordinary consumers outside the areas of existing undertakings in the District. It may not, without the consent of the Electricity Commissioners, supply authorised undertakings or large power users in the area of a power company. The Board will also supply electricity to the Central Electricity Board, after satisfying the electrical requirements of the area, and will take over the powers of the C.E.B. in the District.

Preparation of Schemes

The Board will prepare development, constructional and distribution schemes. The first, showing the water-power resources to be utilised and the situations of generating stations and transmission lines, has to be approved by the Electricity Commissioners and confirmed by the Secretary of State.

Consultative Amenity and Fishery Committees are to be appointed and the Secretary of State may require the Board to give effect to any of their recommendations that do not relate to a confirmed scheme.

Prices charged for electricity supplied by the Board will be determined by regulations made by the Secretary of State after consultation with the Electricity Commissioners so that, taking one year with another, income shall balance expenditure. The Board may provide out of revenue a reserve fund which, together with accumulated interest, shall not exceed one-tenth of the capital expenditure.

Borrowing powers will be exercised with the consent of the Electricity Commissioners and will be subject to regulations made by the Secretary of State with the approval of the Treasury. Such powers include the payment of interest on working capital prior to trading operations and suspension of repayments. Stock shall be issued and dealt with according to regulations made by the Secretary of State with the approval of the Treasury, which may guarantee the payment of the interest and/or the principal of loans, not exceeding £30 million in the aggregate.

Sales to Central Board

The Central Electricity Board shall be bound to purchase such an amount of electricity as the Board may from time to time undertake to supply. The Board shall notify by November 30th the amount of electricity it will engage to supply during the following calendar year, *viz.*, the maximum kW at any time and the number of kWh in each month, these figures not being less than those of the previous year unless three years' notice of a reduction has been given.

For electricity supplied to the grid the price, unless otherwise agreed, will be equivalent to the cost of production at the steam station which, after adjustment for load factor and for the average cost and calorific value of coal supplied to generating stations in Central Scotland, is the most economical steam station controlled by the C.E.B. (This differs from the Cooper Report in which "the most efficient steam stations in Scotland" were taken as the criterion.)

Electricity so supplied is to be delivered in such quantities and at such times as the C.E.B. may require to points on the grid in the Central Scotland Area which (failing agreement) may be decided by the Electricity Commissioners. The C.E.B. may also purchase further quantities of electricity on such terms as may be mutually agreed. The Board may purchase electricity from the C.E.B. and, for that purpose, shall be an authorised undertaking operating in the Central Scotland Electricity Scheme.

The Board may, with the sanction of the Electricity Commissioners, enter into agreements for the transfer to it of undertakings in the District and for the joint use with other undertakings of any main transmission line. Undertakings receiving a supply from the Board at less cost than that at which they could have provided it shall pass on the benefit to their consumers by a reduction of charges or, with the approval of the Commissioners, in any other manner incidental to the development of the undertaking.

* *Electrical Review*, December 25th, 1942.

PERSONAL and SOCIAL

News of Men and Women of the Industry

A COMPLIMENTARY dinner was given at Cardiff on January 20th, in honour of **Mr. A. Ellis,** M.Inst.C.E., M.I.E.E., on the occasion of his receiving the M.B.E. in the New Year's Honours. The chair was taken by Sir Robert Webber, J.P., D.L., and there was a large and distinguished company. During the evening Mr. Ellis was presented with a handsome piece of plate.

The British Empire Medal has been awarded to **Mr. Jesse Clark,** who drove his lorry in front of two runaway trams at Southampton, bringing them to a standstill.

Mr. C. T. Westlake, borough electrical engineer at High Wycombe, was due to retire in July next but he has consented to serve for a further twelve months.

Mr. W. A. H. Parker, A.M.I.E.E., Assoc. A.I.E.E., has resigned his position as sales engineer to the West Gloucestershire Power Co. and is taking up new work as technical adviser to several industrial concerns. Before joining the West Gloucestershire Co., Mr. Parker was with the Lancashire Electric Power Co.

It is announced that, on the joint recommendation of the presidents of the Royal Society and the Institution of Civil Engineers, the Council of the Institution of Civil Engineers has awarded the James Alfred Ewing Medal for 1942 to **Dr. R. E. Stradling,** C.B., M.C. The Ewing Medal is awarded annually for specially meritorious contributions to the science of engineering in the field of research.

Dr. Harold Moore, C.B.E., who has been director of the British Non-Ferrous Metals Research Association since 1932, has been awarded the Platinum Medal of the Institute of Metals, of which he was president in 1934-36.

Mr. A. G. Livesay, hon. secretary to the Engineers' Club, Manchester, recently underwent an operation for peritonitis, and subsequently was critically ill for some time. We are glad to learn, however, that he has now been permitted to return to his home, and is making good progress.

Mr. J. R. Thomas, F.C.A., has been appointed secretary of the Association of Engineering Distributors. All future communications should be sent to the secretary at Hastings House, 10, Norfolk Street, London, W.C.2.

Mr. H. C. Appleby, M.Inst.F., A.M.I.Mech.E., of the Bristol Corporation Electricity Department has been "lent" to the Ministry of Fuel and Power for the duration of the war.

Mr. H. B. Hicks is joining the Rawlplug Co., Ltd., on February 1st. For five years he was assistant advertising manager of the Birmingham Small Arms Co., Ltd., and for nine years assistant advertising manager of the Chloride Electrical Storage Co., Ltd. He has also served in an advertising capacity for the Coal Utilisation Council, Ideal Boilers & Radiators, Ltd., and Homo, Ltd. **Mr. H. A. Greenland,** who is now London Office manager of the Rawlplug Co., will continue to control advertising with Mr. Hicks as his first assistant.

Under a rearrangement of the board and management staff of John I. Thornycroft & Co., Ltd., **Sir John E. Thornycroft** becomes governing director and chairman. **Lieut.-Cmdr. J. W. Thornycroft, Mr. T. Donaldson** and **Mr. J. Maughfling** are appointed joint managing directors and **Mr. A. H. Musto** succeeds Mr. Maughfling as secretary, **Mr. N. M. Millard** being appointed assistant secretary.

Obituary

Lieut. A. J. W. Matthews.—We extend our sympathy to Sir Ronald Matthews, chairman of the Brush Electrical Engineering Co., Ltd., and Lady Matthews in the loss of their only son, Lieut. Anthony John William Matthews, R.E., who was killed in action in North Africa in December.

Flying Officer H. F. Hamilton (25), who has been killed on active service, was in the drawing office of A. Reyrolle & Co., Ltd., before joining the R.A.F.

Mr. L. Kallir, M.I.E.E., retired director of the A.E.G.-Union Electric Manufacturing Co., Vienna, died in a London nursing home on January 7th, at the age of sixty-eight. He will be remembered as a pioneer of electric power generation and transmission in Austria and Czecho-Slovakia. He was a past-president of the Association of Electrical Engineers, Vienna, and for many years chairman of its Committee for Standard Specifications. He represented his country in the I.E.C., and as an official delegate at the C.I.G.R.E. and World Power Conferences.

Mr. Kallir's contribution to a well-known Continental handbook on "Power Current Engineering" was concerned with "Power Transmission," and was recognised as a most comprehensive treatise on the subject. He was the author of several important articles in the Continental technical press. His outstanding qualities as an engineer were matched by a charming character and a deeply humane attitude to those serving under him. There was no place for an upright man of his kind when German influence began to overrule first the economic and then the political life of his native country.

He came to this country in 1938, and the E.R.A. gave him an opportunity to continue in his lifelong devotion to the art of electrical engineering.

Mr. F. A. Smith.—We regret to learn of the death, on January 23rd, of Mr. Fred A. Smith, general secretary of the Amalgamated Engineering Union. He had just left hospital, where he had had an operation involving the loss of a leg. Mr. Smith was made an O.B.E. in the New Year Honours.

Mr. E. J. Walsh.—We regret to record the death of Mr. Edward Joseph Walsh, A.M.I.E.E., which occurred on January 19th. Mr. Walsh was the proprietor of E. J. Walsh & Co., mechanical and electrical engineers, of Edinburgh.

COMMERCE and INDUSTRY

Electrical Machine Economy. *F.B.I. Taxation Appeal.*

Wartime Generators

THE British Standards Institution has recently issued, at the request of the Directorate of Industrial Electrical Equipment, Machine Tool Control, a War Emergency Specification B.S. 1084/1942 which applies to alternators and DC generators of 50 up to 1,000 kVA or kW at any rated speed for use with internal combustion engines, and is framed to establish an economic level of good performance whilst avoiding wasteful elaboration and extravagant use of material.

The Minister of Supply has now issued to electrical manufacturers a Direction under which all machines within this range must comply with the new specification. The Direction excludes from its operation machines for use on board ship and those already in hand and special requirements dealt with by individual licence or general direction issued by the Minister of Supply. Applications in respect of such requirements should be addressed to the Director of Industrial Electrical Equipment, Ministry of Supply (Code V.A.), Machine Tool Control, 35, Old Queen Street, S.W.1.

Economy in labour and material is the purpose of this Direction which came into force on January 21st. The most efficient use of engine-driven generating sets is only achieved when the generator output is correctly related to the engine capacity.

These arrangements have been made after consultation with the electrical manufacturers through the Machine Tool Control Electrical Advisory Panel.

Limitation of Supplies

The Board of Trade announces that the quota for lighting fittings under the Limitation of Supplies (Miscellaneous) Order for the six months from February 1st to July 31st is again to be 5 per cent. of supplies during the standard period (the year ended May 31st, 1940). The existing prohibitions on the supply by manufacturers of decorated and certain metal fittings will be maintained in force.

Against Northern Ireland D.J.B.

The Belfast City Municipal Administrators have turned down the proposal of the Electrical Power Engineers' Association to form a District Joint Board of Employers and Members of Staff (Electricity Supply Industry) for Northern Ireland. The Town Solicitor pointed out that their decisions in regard to the salaries and wages of employees might be over-ruled by the proposed Joint Board, and therefore in his opinion the proposal should not be approved.

Charge Engineers' Salaries

By an award made last year the Industrial Court decided that charge engineers employed in stations falling in Classes J, K, L and M of the National Joint Board schedule (those over 100,000 kW) should be raised from Grade 8 to Grade 7. The schedule provides that there shall be increments in salaries after the first two years of service and after the subsequent two years. The award was interpreted by supply undertakings to mean that the re-graded engineers were to be paid the salaries appropriate to the first step of Grade 7, but the Electrical Power Engineers' Association maintained that service in Grade 8 should count for increments in the new grade.

The Industrial Court was asked to decide the point and has now issued an award ruling in favour of the Association's contention. The effect is that charge engineers affected by the previous award will be transferred to Grade 7 to the column of the salary schedule which they had attained on May 22nd, 1942, the date of transfer.

High-frequency Industrial Heating

An arrangement has been made between Ferranti, Ltd., and Wild-Barfield Electric Furnaces, Ltd., whereby the two companies are to collaborate in the development of h.f. industrial heating equipment. This collaboration between the technical departments and pooling of experience will enable more rapid advances to be made in metallurgical heat-treatments and kindred processes. The h.f. generating equipment will be designed and manufactured by Ferranti, Ltd., while the heating, handling and quenching equipment will be manufactured by Wild-Barfield. Sales and installation of the Ferranti-Wild-Barfield equipment will be handled by Wild-Barfield, to whom all inquiries should be addressed.

Winding-up Petition

In the Companies Court on Monday, Mr. Justice Bennett had before him a petition for the compulsory winding up of Electrical Utilities, Ltd. Counsel explained that the petitioners had expected a big contract and an advertisement would have been detrimental to the company. His Lordship said as the petition had not been advertised it must be struck out.

F.B.I. on Taxation

In a memorandum submitted to the Chancellor of the Exchequer, the Federation of British Industries points out that essential working capital is being drawn away from industrial firms by taxation. After the war industry may no longer be able to rely on outside sources for finance ; the alternative is for it to provide its own finance out of retained profits. The Federation therefore submits that these retained profits should be granted some relief from taxation, subject to necessary safeguards.

The Federation also seeks taxation relief to industry by a new approach to those costs of production arising from the taxpayer's need to write off over their expected life all the assets employed in the business. In the past, in many cases, no allowance has been made for taxation purposes. It was inequitable that such allowances were not made when taxation was low ; now

that it is high these disallowances are in effect a tax on capital. Particular reference is made to freehold buildings (not land), leasehold premises, the cost of patents, trade marks and designs, and the residual value of assets not replaced.

The Chancellor's attention is drawn to the hardships inherent in the excess profits tax, intensified by the 100 per cent. rate, and the F.B.I. regrets that the Government cannot see its way to reconsider the rate, especially as the promised return of 20 per cent. can be only of contingent value. The hardship suffered by most concerns which have to work on a substituted standard should be mitigated by the raising of the "ceiling" to correspond with the percentage allowed to new concerns or newly introduced capital.

Representation in South Africa

A correspondent informs us that a business friend in South Africa with good connections in the electrical trade wishes to get into touch with British manufacturers of electrical accessories who want a South African representative. We shall be pleased to pass on communications from interested firms.

Brentwood Fuel Saving Exhibition

Brentwood has taken its share in the National Fuel Economy Campaign by holding an exhibition at the electricity showrooms from January 11th to 16th. The exhibition was opened by Mr. F. Grisewood, the chair being occupied by Mr. E. G. Stone, chairman of the Urban District Council, who thanked Mr. H. T. Timberlake, engineer and manager of the Brentwood District Electric Co., Ltd., for the great help he had given as chairman of the Exhibition Committee in organising and arranging the exhibition, and also the directors of the company for their kindness in granting the use of the showroom premises.

The exhibition consisted of set pieces illustrating what to do and what not to do to save fuel, and during the week cookery demonstrations and fuel economy talks were given each afternoon by speakers from the Ministry of Food, Essex Education Committee, the Gas Light and Coke Co., and the Brentwood District Electric Co., Ltd. Fuel economy talks for school children were also arranged. Other features included fuel economy songs by the "Brentwood Targeteers," a party of scholars from the Brentwood Girls' High School, and also the putting over of "fuel flashes" by means of loudspeakers. A window dressing competition for shopkeepers was arranged, each shopkeeper having to incorporate a fuel economy poster in the display. This was most helpful in giving publicity to the exhibition.

Mr. F. Grisewood opening the Brentwood Fuel Saving Exhibition

The accompanying picture shows Mr. F. Grisewood declaring the exhibition open. Also in the photograph are Mr. Timberlake, Mr. J. J. R. Day, Clerk of the Brentwood Urban District Council, Mr. R. Nelson and Mr. J. W. Vincent, directors of the Brentwood District Electric Co., Ltd., and Mr. F. G. Pratt.

Fuel Efficiency

Considerable success has been achieved by the fuel efficiency training courses arranged by the Committee on the Efficient Use of Fuel set up by the Ministry of Fuel and Power. Over sixty colleges and universities are providing accommodation for the courses and there have been 9,307 enrolments. As many boiler-house men cannot be spared to attend courses, owing to labour shortage, a film is being produced by the Ministry of Information for instructional purposes and it is hoped to have it ready very shortly.

The Committee feels that the organisation of wartime training does not complete its task and it therefore has given consideration to future policy. It is suggested that the present emergency scheme should be continued before considering more advanced training. The "Fuel Efficiency Handbook" which is being produced will embrace the use of all fuels for industrial purposes and will be issued at a nominal cost. The handbook will be the basis of future training sponsored by the Ministry and it is hoped that technical colleges may be persuaded to use it as the basis of instruction for their evening classes and that universities with fuel technology departments will make use of it.

In the existing courses instruction has been spread over ten or twelve weeks. There has been a demand for shorter more intensive courses and the Committee is considering courses occupying a full week and embracing not only lectures and discussions but also demonstrations of various types of plant, including the actual operation of such plant by the students.

It is further suggested that there is a need

for a permanent central training college for educating lecturers, management staff, boiler-house firemen and post-graduate fuel technology students in practical fuel efficiency, equipped with carefully selected and interchangeable plant for demonstration and testing.

Fuel Conversions

A reminder is given to all industrial consumers and prospective consumers of fuel by the Ministry of Fuel and Power that they must not change from one class of fuel to another, or install new fuel-burning plant, without having first ascertained that the fuel will be available.

If a consumer needs to install new plant or feels that the conversion of his plant from one fuel to another is desirable he should approach the Ministry principally concerned with his production if he is working for one of the Production Departments. Otherwise he should approach the division of the Ministry of Fuel responsible for the fuel he intends to use. In the case of electricity the Electricity Commission should be approached through the local electricity supply undertaking. He will then receive advice in the light of local fuel supply conditions and other relevant circumstances.

School for Instrument Making

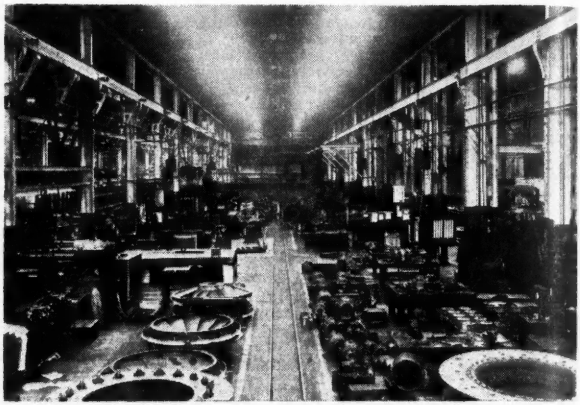
The Junior Technical School for Instrument Making and Horology of the Northampton Polytechnic, London, E.C., which has been evacuated to St. Albans, commences its next school year on May 3rd. Admission is conditional upon passing the entrance examination to be held on April 12th. Particulars can be obtained from the secretary of the Polytechnic, St. John Street, London, E.C.1.

Standards by Consent

In the leading article in our issue of January 15th, we referred to "the Electrical Industry Committee of the Institution of Electrical Engineers." This should have read "of the British Standards Institution." The I.E.E. has set up a panel of members to deal with questions of production, manufacture and employment, but this is a sub-committee of its Post-War Planning Committee.

Factory Lighting Installation

The accompanying photograph shows a section of a large engineering works for which a new lighting scheme has recently been carried out by the Metropolitan-Vickers Electrical Co., Ltd. The installation comprises about 330 points, with a total load of 240 kW, and the greatly improved lighting under the new scheme, ranging from 13 to 20 ft.-candles in different sections, has resulted in a considerable increase of production. The bay illustrated, where parts of turbines and ventilating plant are assembled, is lighted by "Metrovick" 400-W mercury lamps in deep dispersive reflectors mounted at a height of 29 ft., giving a service illumination of 13–14 ft.-candles. In the marking-off bay a closer arrangement of similar units gives 18 ft.-candles. The main machine shop is illuminated to a service value of 20 ft.-candles. In addition to the main lighting the installation includes pilot lighting throughout the works.



"Metrovick" discharge lighting in a large engineering factory

Instrument Makers' Centenary

Alexander Wright & Co. were established in 1843 at Westminster, the original works being on what is now the site of Thames House. The works address at Page Street, Westminster, was vacated when the area was scheduled under the rebuilding scheme, and the works were removed to South London. The "Westminster" association is still retained, however, through the offices and showrooms at Westminister Palace Gardens.

Mr. Alexander Wright was an engineer of repute in many fields, and founded the business primarily as a gas engineer and instrument maker. Many gas appliances, instruments and apparatus had their origin in those early days, Wright's Register still being well known and used in several works. His successors (on incorporation of the firm in 1896) carried on the basic principles laid down, extended the field of activity and were pioneers in the scientific control of many industrial processes—in photometry, calorimetry, "gravitometry," pressure and vacuum recording and indicating and in the promotion of fuel economy by the introduction of fuel calorimeters, CO_2 recorders, and draught gauges of many kinds. Under present conditions the company has been called upon to undertake much special work.

On the occasion of its centenary the company has issued a wall calendar showing an impressive view of Westminster. This form of memento

is in lieu of a more elaborate plan which had been devised to mark the occasion, but subsequent official restrictions and regulations prevented the plan being carried into effect.

Control of Bolts and Nuts

The scope of the Control of Bolts, Nuts, Screws, Screw Studs, Washers and Rivets (No. 1) Order, 1943 (S.R. & O. No. 41, Stationery Office, 1d.) is indicated by its name so far as iron and steel products of all sizes are concerned. It also covers bolts, nuts, screws and studs made wholly or partly of non-ferrous metals less than ¼ in. in diameter.

A memorandum dealing fully with the operation of the Order has been prepared by the Ministry of Supply. This points out that hitherto all iron and steel bolts, etc., have been directly controlled under the No. 15 Iron and Steel Order (1941) and their distribution has been regulated by the Iron and Steel Distribution Scheme. Although the Order now ceases to apply, the distribution scheme is still applicable to these articles and is now extended to cover the non-ferrous products controlled by the new Order. The effect is that all the controlled articles (including non-ferrous bolts, etc.) can be acquired by the use of " M " Form authorisations as part of the non-alloy steel authorised. Where such authorisations are insufficient or where they are not yet held application should be made to the appropriate department as printed in the Iron and Steel Distribution Scheme.

The new Order also fixes maximum prices for the various classes of bolts, etc.

Birmingham Factory Appeals

Mr. Oliver Lyttelton is to open to-day (Friday) in the New Street Gallery of the Royal Birmingham Society of Artists the exhibition of "Tell the War-Worker" factory appeals which is being held in Birmingham for eight days from the end of this month. The exhibition, which is being voluntarily organised by a committee representing Birmingham industry, is for the benefit of factories on war work generally and aims to pool Midland experience gained in making wartime appeals to works personnel. A large number of entries has been received, including posters, leaflets and displays covering all aspects of the war effort on the production front, and there will be nearly 300 exhibits representing the contributions of over fifty firms. Admission will be by invitation only. Those in industry wishing to visit the exhibition can obtain tickets from the honorary secretary, Mr. J. F. Bramley, safety and welfare superintendent of the Austin Motor Co., Ltd., Longbridge, Birmingham.

Adjustment of Earth Wire

The Scottish Co-operative Wholesale Society, Ltd., was fined £10 at Stranraer Sheriff Court on January 12th for failing to take adequate precautions at its Creamery, Sheuchan Street. It was stated that a woman employee had received a shock while at work in the curd mill and vat, through a faulty adjustment of the earth wire. The company pleaded guilty.

An Inspector of Factories gave a technical description of the electrical fittings and the sheriff said that a good deal of this was " indigestible ;" he wanted to know wherein lay the offence. The inspector replied that the company did not have proper attention given to the electrical equipment. It was a serious offence and might have resulted in a bad accident. Apparently the engineer was away, and a properly trained man should have taken his place.

For the company it was stated that a young woman had received an electric shock, but there were no serious consequences. An earth wire had been wrongly connected. The engineer in charge was in hospital and the man who had attended to the machine maintained that the wires had been properly connected. The equipment had been in use for a week after the adjustment and there had been no trouble during that time.

Domestic Appliance Repairs

Premier Electric Heaters, Ltd., ask us to make it clear that they are still undertaking repairs of Premier domestic appliances, though of course the pre-war promptness cannot be guaranteed.

Wages in the Cable-Making Industry

The Joint Industrial Council for the Electrical Cable-Making Industry announces that the cost-of-living figure on January 1st (99 points above the 1914 level) will not involve any alteration in wages on the third pay-day in February.

Trade Announcement

The head office of the Electric Supply Corporation, Ltd., and associated companies is now at Brook House, Park Lane, London, W.1 (telephone : Mayfair 3722 ; telegrams : " Elsucor, Audley," London).

Practical Electrician's Pocket Book

The address of the publishers of this pocket book (*Electrical Trading*) is 92, Long Acre, W.C.2, not Bedford Street, as stated in our last issue.

Calendars

We are informed that the Liverpool Cable Co., Ltd., Bootle, Lancs, and Frederick Smith & Co., Ltd., still have copies of their 1943 calendars available. In applying for them it is necessary to send a nominal fee.

INFORMATION DEPARTMENT

GENERAL inquiries from readers relating to sources of electrical goods, makers' addresses, etc., are replied to by our Information Department through the post. Inquiries should be accompanied by a stamped addressed envelope.

Our extensive records enable us to reply to most queries, but occasionally we ask for our readers' assistance in tracing names and addresses not known to us. We should be glad to have such information regarding the following :—

DAYFAN fractional HP motor.

I.E.E. Meetings

Arrangements for Remainder of Session

FOR the second half of the 1942-43 session the following ordinary, informal and Section meetings of the Institution of Electrical Engineers have been arranged. All start as before at 5.30 p.m. In order that members of the Institution may have opportunity of seeing some of the talking films of honorary members and Faraday Medallists which have been prepared in recent years, arrangements are being made for one or two of these films, which are all short, to be shown in the Lecture Theatre on forthcoming evenings when there are ordinary meetings.

On these occasions tea will be available from 4.45 instead of 5 p.m. until the commencement of the ordinary meeting at 5.30 p.m. The first films will be shown on February 4th, as follows: 5 p.m.: Sir Oliver Lodge. 5.10 p.m.: Sir William Bragg.

ORDINARY MEETINGS (Thursdays)

February 4th.—Papers: "General Factors Affecting the Unification of Electricity Supply Tariffs," by Mr. C. T. Melling, M.Sc.Tech., and "Towards the 'Correct' Domestic Multi-part Tariff," by Mr. P. Schiller.

March 4th.—Paper: "Air-blast Circuit-breakers," by Mr. A. R. Blandford.

March 25th.—Paper: "Engineering Economics," by Sir Frank Gill, K.C.M.G., O.B.E. (Joint meeting with the Institutions of Civil and Mechanical Engineers.)

April 1st.—Paper: "The Effect of the National Grid on the Operation and Maintenance of Secondary Power Stations," by Mr. R. A W. Connor.

April 29th.—Thirty-fourth Kelvin Lecture: "Mechanical Integration in the Solution of Electrical Problems," by Prof. D. R. Hartree, M.A., Ph.D., F.R.S.

May 13th.—Annual general meeting followed at about 6 p.m. by a paper on "Standardisation of Motor Dimensions," by Mr. H. Marryat.

INFORMAL MEETINGS (Mondays)

February 22nd.—Discussion on "Single- to Three-phase Conversion with special reference to the Ferraris-Arno System," to be opened by Mr. A. H. Maggs, B.Sc.

March 22nd.—Discussion on "The Electrical Possibilities of Pre-fabricated Buildings," to be opened by Mr. G. Smith.

April 19th.—Discussion on "Infra-red Lamp Heating and its Application to Industrial Purposes," to be opened by Mr. F. E. Rowland.

INSTALLATIONS SECTION (Thursdays)

February 11th.—Informal discussion on "The Use of Electricity in Relation to Fuel Economy," to be opened by Mr. R. H. Rawll.

March 11th.—Papers on "The Future of the Domestic Wiring Installation." Section 1: "Immediate Developments," by Messrs. W. J. H. Wood and Forbes Jackson. Section 2: "The Distant View," by Messrs. G. Smith and E. Jacobi.

April 8th.—Paper: "The Protection of Structures Against Lightning," by Mr. J. F. Shipley.

May 6th.—Paper: "Electrical Installations in Hospitals," by Mr. F. C. Raphael.

MEASUREMENTS SECTION (Fridays)

February 19th.—Paper: "Busbar Protection: A Critical Review of Methods and Practice," by Messrs. M. Kaufmann and W. Szwander. (Joint meeting with Transmission Section.)

March 5th.—Informal discussion on "Experiences with Pivots and Jewels in Wartime," to be opened by Mr. G. F. Shotter.

March 19th.—Paper: "Standardisation of Integrating Electricity Meters," by Mr. C. W. Bridgen.

April 16th.—Particulars to be announced later.

May 21st.—Lecture on "Measurement of Small Quantities," by Dr. E. H. Rayner, M.A.

TRANSMISSION SECTION (Wednesdays)

February 10th.—Paper: "Standardisation of Single-Circuit Overhead Lines up to 33 kV in Great Britain," by Messrs. H. Willott Taylor and K. L. May.

February 19th (Friday).—See Measurements Section.

March 10th.—Paper: "The Ventilation of Substations," by Messrs. F. Favell and E. W. Connon, B.Sc., B.Eng.

April 14th.—Paper: "The High-pressure Gas-filled Cable," by Messrs. C. J. Beaver and E. L. Davey, B.Sc.

May 12th.—Papers on "Protective Systems for Rural Distribution up to 33 kV," by Messrs. D. C. Field, B.A., O. Howarth, R. W. Steel and A. W. Allwood, B.Sc. Paper on "Automatic Selective Isolation of Sustained Earth Faults on Networks Protected by Petersen Coils," by Mr. K. I. Brown.

WIRELESS SECTION

February 3rd (Wednesday).—Paper: "The University Education and Industrial Training of Telecommunication Engineers," by Prof. Willis Jackson, D.Sc., D.Phil.

February 16th (Tuesday).—Informal discussion on "Electronics in Industry," to be opened by Messrs. E. Cattanes, G. T. Winch and A. L. Whiteley, B.Sc.

March 3rd (Wednesday).—Particulars to be announced later.

March 16th (Tuesday).—Informal discussion on "Factory Testing of Radio Equipment," to be opened by Mr. F. L. Hogg.

April 7th (Wednesday).—Lecture on "Radio Exploration of the Ionosphere," by Sir Edward Appleton, M.A., D.Sc., F.R.S.

April 20th (Tuesday).—Informal discussion on "Metal Rectifiers and their Applications to Radio and to Measurements," to be opened by Mr. S. A. Stevens, B.Sc.(Eng.).

May 5th (Wednesday).—Particulars to be announced later.

ELECTRICITY SUPPLY

New Kingston Station. North Wales Water Power.

Ashton-under-Lyne.—KETTLE REPAIR PROBLEM.—Because of a shortage of spare parts, 500 electric kettles are awaiting repair at the Corporation Electricity Department stores.

Eccles.—SUPPLY EXTENSION.—We regret that the note under this heading in our January 15th issue was incorrect. The borough electrical engineer informs us that it is not proposed to lay a main as stated.

Hull.—EFFECT OF PEACE ON ESTIMATES.—At a meeting of the Corporation Electricity Committee last week when the general manager reviewed the financial situation, Councillor T. Hardaker asked what would be the effect upon the estimates if the war should finish before the end of the next financial year. Mr. Bellamy replied that for every three months they would be better off by at least £20,000. In his review Mr. Bellamy stated that the statutory increases in the price of coal meant an average increase of £60,000 in the current and next financial years as compared with 1941-42.

Kingston - upon - Thames. — POWER STATION SCHEME.—Preliminary arrangements are being made to enable the work of constructing the proposed £2,000,000 generating station near Canbury Gardens to be started soon after the war. In connection with the scheme it was reported to the Thames Conservancy Board recently that agreement had been reached between the Board and the Kingston Corporation (acting on behalf of the C.E.B.) with regard to the construction of inlet and outlet channels through the towpath bank of the Thames, for the abstraction and circulation of cooling water.

London.—WATER WORKS INSTALLATIONS.—The Metropolitan Water Board has approved a supplemental estimate of £13,166 for plant and machinery in connection with certain works to the electricity grid supply and £9,588 for making pumping and electrical connections to the works of other water undertakings in the region. Electric lighting is to be installed at the Cricklewood water works at a cost of £300.

Middlesbrough.—TRAFFIC SIGNAL CHARGES.—The Electricity Committee has revised its charges for lighting and maintaining traffic control signals and coloured light signals. The rate for time-actuated lights will be £10 per quarter and for traffic-actuated lights £6 4s. a quarter. The rates for other signs will be from 17s. 8d. to 31s. a quarter.

North Wales.—WATER POWER RESOURCES.—Last week in the House of Commons, Sir Henry Morris-Jones asked the Minister of Fuel and Power whether he would set up a committee, on the lines of the Committee on Hydro-Electric Development in Scotland, to consider forthwith an analogous development in North Wales, where there were large undeveloped water-power resources, and where at present the agricultural community was largely deprived of electric power.

Major Lloyd George replied that the water-power resources of North Wales, which were very much smaller than those of the North of Scotland, formed the subject of an investigation in 1921 by the Water Power Resources Committee of the Board of Trade. Since then they had been substantially developed as part of a Grid Area Scheme, which ensured that the electricity requirements of North Wales, so far as they could not be met from the water-power resources were provided for from other sources of supply. In view of these developments he could not agree that the undeveloped water power resources of North Wales were great enough to warrant further investigation, at any rate at the present time.

ECONOMY MISAPPREHENSION.—Mr. James Rankin, general manager of the North Wales Power Co., Ltd., stated at the quarterly meeting of the North Wales and South Cheshire Joint Electricity Authority, at Llandudno, that there seemed to be a widespread and erroneous impression among consumers in North Wales that they need not economise in the use of electricity owing to the fact that it was generated by water-power within the company's area. He pointed out that while the use of water-power for the generation of electricity saved many thousands of tons of coal a month, it was only being used to supplement electricity generated at steam stations. Every unit used unnecessarily in North Wales meant that another unit had to be generated at a steam station.

Stockport.—LOANS.—The Electricity Committee has received sanction to the following loans :—£8,538 for mains and services and £3,167 for substations and equipment.

" STARLIGHTING " PLANS.—The Corporation has approved the purchase of 600 standard fittings for electric lamps on main roads, as part of a scheme for " starlighting." One thousand fittings for gas lamps in side streets are to be purchased.

Stranraer.—ELECTRICITY IN HOUSES.—Among recommendations on housing design by Stranraer Town Council to be considered by the Convention of Royal Burghs are the provision of power plugs in each room, cooking by gas or electricity, and refrigerators.

Sunderland.—EXTENSIONS.—The Town Council has agreed to carry out further works at the electricity plant at a cost of £5,555.

Swansea.—LIGHTING AT BUS STOPS.—The Corporation is seeking the consent of the Ministry of Home Security for the installation of restricted lighting at bus stopping places.

Warrington.—SEPARATION OF ELECTRICITY AND TRANSPORT.—The joint committee which has for forty years administered the municipal electricity and transport undertakings has been divided into separate Electricity and Passenger Transport Committees in consequence of the growth of the undertakings.

Workington.—NEW SUPPLIES.—The Electricity Committee is to give supplies of electricity to a water boosting pump and to St. Helen's Colliery and works. A duplicate cable is also to be laid at a cost of £665.

SUBSTATION.—A site for a substation has been acquired.

Steam Boiler Control

Views Expressed at an I.E.E. Meeting

IN opening the discussion on boiler house instruments for combustion control (the paper by Messrs. Barker and Hancock on the subject was outlined in our last issue) before the Measurements Section of the Institution of Electrical Engineers in London, Mr. H. L. Horsman (London Power Co.) said it was a great pity that there was no great encouragement to associate automatic control with fuel characteristics. The results of automatic boiler control were, at times, very largely masked and it was difficult to prove the efficacy of automatic boiler control because of the many contending factors. CO_2 recorders had had more to do with the elevation of combustion efficiency than anything else, but they must be properly placed.. With remote manual control in a certain super-power station the boiler efficiency varied between 88·3 and 88·5 per cent. regularly year after year. That was to some extent the outcome of judgment exercised by the human element. Therefore, it must be agreed that even if complete automatic control were applied, there would not be much room for improvement. Complete automatic control might in some cases be necessary, especially where the load was highly variable.

"Badly Neglected"

Mr. R. W. Griffen (Elliott Bros., Ltd.) said it had always seemed to him that what was now the Measurements Section of the Institution had badly neglected the application of instruments, particularly when electrical principles were involved. That apparent neglect was unfortunately reflected throughout the industry. Instrument makers in Germany had attained to the enviable position of telling the user what he required and announcing what they proposed to supply him with in the way of standardised equipment. In this country such a state of affairs was almost unthinkable and special instruments had to be made in very small numbers, sometimes singly. Hence the high prices and the heterogeneous collection of oddments which often constituted even modern installations. There were, however, signs of improvement.

Users could save themselves considerable trouble and expense by periodic inspection of instruments to ensure that any small faults, or signs of wear, were put right before serious trouble developed. At the same time, he did not suggest that users should attempt repairs beyond their capabilities.

Mr. P. G. Lloyd (North Eastern Supply Co.), said that in the design, construction and maintenance of instruments and control panels during the past twenty years there seemed to have been a tendency to strive after extreme initial accuracy and ornateness at the expense of reliability. The aim should be the highest average accuracy obtainable all the year round with the minimum of maintenance. He failed to see any justification for the extra capital outlay involved in automatic combustion control, particularly when the grading of coal was so inconsistent. In most power stations the load characteristics were known and prepared for, while in the larger base load stations load variations were reduced to the minimum. In certain types of industrial plant where less skilled labour was employed, or where a straight coal was used, complete automatic control might be advantageous, although even there the automatic gear would require skilled attention.

Mr. J. Bruce said that it was possible to spend £10,000 on instruments and not gain 1 per cent. in efficiency. Those instruments needed a well-trained combustion engineer on the job all the time who thoroughly understood the readings.

Mr. John Reid, speaking as a marine engineer, said that the manner in which instruments were left out of marine installations was nothing less than criminal. There was no reason why a small installation should be less instrumented than a very large one.

Control of CO_2

Mr. J. E. O'Breen (James Gordon & Co., Ltd.), disagreed with the authors that a remote control system should be electrical. Personally he would prefer a start being made with pneumatic operation designed in such a way that later on it could be extended to full electrical operation. Nothing was said in the paper of the automatic control of CO_2. Why had that disappeared? Was it because CO_2 recorders for automatic control were not sufficiently accurate, or was there some other reason?

In America automatic control had been fitted to a large number of ships with excellent results, as regarded smokeless combustion. That was specially important in convoy work now and the Admiralty should investigate the claims of automatic control from that point of view.

Mr. F. L. Freeman remarked that the carrying out of the principles outlined in the paper was comparatively easy in large modern installations, but in smaller plants designed some years ago it was sometimes not possible to get satisfactory measurements of some of the quantities at all.

Mr. S. B. Jackson said there was a great deal of room for missionary work in connection with automatic control, the need for which was seen in the fact that in a power station in the South-east England area something like 700,000 kW was picked up in ten minutes on one occasion. On another occasion when black fog suddenly descended 400,000 kW was taken on in seven minutes. Possibilities in the use of electricity in the future indicated that automatic methods would have to be more generally used than was now the case. When the C.E.B. schemes were first put into operation the average cost of coal in the price agreements was something like 13s. 6d. per ton, but the cost was now, in many stations, 400 per cent. above that figure. Therefore, even the small economy of 0·5 per cent. which had been mentioned would seem to justify automatic control. From investigations which he had carried out, however, he believed the gains would be very much larger.

Mr. S. H. Barker, in a brief reply to the discussion, said that there seemed to be a danger of expecting too much from automatic control. Men responsible for working such a system must be properly trained. As to the suggestion that very high boiler efficiencies were being obtained with remote manual control, with what effort were these results obtained? A great deal of responsibility could be taken off the shoulders of the men in control of the manual system. His own experience had been that generally instruments were fairly well maintained; indeed, there had been a considerable improvement in recent years. There were greater opportunities for automatic control in the very much larger number of industrial plants as compared with the comparatively few superpower stations and base load stations.

FINANCIAL SECTION

Company News. Stock Exchange Activities.

Reports and Dividends

Whitehall Electric Investments, Ltd., reports that it has now over £1¼ millions in cash which it is unable to invest remuneratively in electrical utility undertakings. It is proposed therefore that half of the £2,500,000 of 7½ per cent. cumulative preference stock shall be redeemed by paying off 10s. in the £. To maintain the holders' voting rights each of the 1,250,000 shares will carry two votes. As the margin of earnings over the amount required to meet the preference dividend is small the stockholders are being asked to agree to a reduction of the rate of interest to 6 per cent. In compensation it is proposed to pay the stockholders 1s. in cash in respect of each share held and to allot them £2 of ordinary stock for each £5 of remaining preference stock. It is pointed out that neither of these benefits would be subject to tax.

To give the company a larger interest in Hallminster Investments, Ltd., and Whitehall Canada, Ltd., the Whitehall Securities Corporation has agreed to transfer 5 per cent. of the capital of these companies (at present it holds 15 per cent. and Whitehall Electric Investments 85 per cent.).

It is estimated that after this repayment the net annual income will be £115,000, before allowing for profits or losses on realisations of investments by Hallminster Investments, Ltd., and allowing for no income from the Athens investment. The 6 per cent. preference dividend will require £75,000. After the reorganisation of capital the value of the company's assets is estimated at not less than £2,500,000, excluding the Athens investment. The company has an ordinary capital of £5,000,000, which is held by the Whitehall Securities Corporation.

Heenan & Froude, Ltd., are offering to shareholders 300,000 5s. ordinary shares at 8s. per share, in the proportion of one new share for every three held. Treasury consent has been obtained for the issue of £75,000 of new capital. The shares offered will rank equally with those outstanding, and applications must reach the company's registrars, Dawnay, Day & Co., 15, Moorgate, London, E.C., by February 3rd. Industrial Finance & Investment has agreed, for a commission of 4½d. per share, to subscribe for any shares not taken up.

The Yorkshire Electric Power Co. is paying a final ordinary dividend of 5 per cent., maintaining the distribution for the year at 8 per cent.

R. A. Lister & Co., Ltd., are again paying a final dividend of 5 per cent. and a bonus of 6 per cent., maintaining the distribution for the past year at 16 per cent.

R. B. Pullin & Co., Ltd., have declared a final dividend of 15 per cent., again making 20 per cent. for the year.

The Tata Power Co. announces a final dividend of 4½ per cent. free of tax, making 7 per cent. free of tax for the year (same).

New Companies

Precision Crystals, Ltd.—Private company. Registered January 8th. Capital, £750. Objects: To carry on the business of producers and manufacturers, either completely or in part, of precision quartz crystals, from raw quartz and other available materials, for radio sound transmitters and receivers, and scientific apparatus, etc. Directors: H. G. Brandon, 18, Oakfield Road, London, S.E.20; and J. D. Ferguson, C.A., 3, Heath Drive, Sutton, Surrey. Registered office: 86-88, Queen Victoria Street, London, E.C.4.

Bendix Manufacturing Co., Ltd.—Private company. Registered January 16th. Capital £1,000. Objects: To carry on the business of manufacturers of, and dealers in, plastic mould-

ings, machiners and workers of plastic materials, engineers, electricians, founders, smiths, etc. Subscribers : J. Bendix, 81, Hermitage Court, Snaresbrook, E.18, and H. H. Goldstaub, 73, Hermitage Court, Snaresbrook, E.18. Registered office : 231, Plashet Road, Plaistow, Essex.

Companies' Returns

Statements of Capital

Isle of Arran Electric Light & Power Co., Ltd.—Capital, £20,000 in £1 shares (19,000 ordinary and 1,000 preference). Return dated August 12th. 17,700 ordinary and 1,000 preference shares taken up. £17,500 paid. £1,200 considered as paid. Mortgages and charges : Nil. Return of allotments made up to August 24th show a further 1,300 ordinary shares allotted for cash.

Mid-Lincolnshire Electric Supply Co., Ltd.—Capital, £700,000 in £1 shares. Return dated October 2nd. All shares taken up. £595,000 paid. £105,000 considered as paid. Mortgages and charges : Nil.

Weald Electricity Supply Co., Ltd.—Capital, £1,000,000 in £1 shares. Return dated March 31st (filed October 23rd). All shares taken up. £671,000 paid (£1 on 346,000 and 10s. on 650,000 shares). £4,000 considered as paid on 4,000 shares. Mortgages and charges : Nil.

Kye Electrical, Ltd.—Capital, £25,000 in 20,000 preference shares of £1 each and 100,000 ordinary shares of 1s. each. 12,502 preference and 92,500 ordinary shares taken up. £17,127 paid. Mortgages and charges : Nil.

Castle Fuse & Engineering Co., Ltd.—Capital, £15,000 in 15,000 shares of £1 each. Return dated October 13th. All shares taken up. £12,998 paid. £2,000 considered as paid. £2 remains unpaid. Mortgages and charges : £2,709 6s. 4d.

Eckington Electric Supply Co., Ltd.—Capital, £5,000 in 5,000 shares of £1 each. Return dated August 12th. All shares taken up. £5,000 paid. Mortgages and charges : Nil.

Pennington, Stevens & Taylor, Ltd.—Capital, £7,000 in 7,000 shares of £1 each. Return dated September 1st. 6,912 shares taken up. £6,762 paid. £150 considered as paid. Mortgages and charges : Nil.

Pye, Ltd.—Capital, £335,200 in £150,000 preferred ordinary stock and £185,200 deferred ordinary stock. Return dated October 14th. All stock issued and fully paid up. Mortgages and charges : Nil.

Colvern, Ltd.—Capital, £30,000 in £1 shares. Return dated September 17th. All shares taken up. £2,500 paid. £27,500 considered as paid. Mortgages and charges : Nil.

Carter & Co. (Nelson), Ltd.—Capital, £5,000 in £1 shares. Return dated July 31st (filed August 7th). 4,150 shares taken up. £4,150 paid. Mortgages and charges : Nil.

British Rola, Ltd.—Capital, £150,000 in 75,000 6½ per cent. cumulative redeemable preference shares of £1 and 750,000 ordinary shares of 2s. each. Return dated March 27th (filed October 9th). 74,450 preference and 750,000 ordinary shares taken up. £39,450 paid on 39,450 preference shares. £110,000 considered as paid on 35,000 preference and 750,000 ordinary shares. Mortgages and charges at date of return : Nil. Since registered : Charge on contract moneys dated October 5th, 1942, to secure all moneys due to Lloyds Bank, Ltd., not exceeding £60,000 at any one time.

Mirrlees, Bickerton & Day, Ltd.—Capital, £600,000 in £1 shares (100,000 5½ per cent. preference and 500,000 ordinary). Return dated August 13th. 71,000 preference and 466,000 ordinary shares taken up. £302,500 paid. £234,500 considered as paid. Mortgages and charges : Nil.

E.R.A. Patents, Ltd.—Capital, £500 in £1 shares. Return dated July 24th. All shares taken up. £500 paid. Mortgages and charges : Nil.

Increases of Capital

Barlow-Whitney, Ltd.—The nominal capital has been increased by the addition of £1,000 in £1 ordinary shares beyond the registered capital of £5,000.

Rogerson (Insulation), Ltd.—The nominal capital has been increased by the addition of £400 in £1 ordinary shares beyond the registered capital of £100.

Mortgages and Charges

Mechanical & Electrical Industries, Ltd.—Assignment dated December 31st, 1942, charged on all moneys, etc., due to the company under certain contracts, to secure all moneys due or to become due from the company to Barclays Bank, Ltd.

Sordoviso Switchgear, Ltd.—Satisfaction in full on September 24th, 1942, of mortgage registered April 25th, 1940, securing £500.

Liquidations

Radio & Electrical Developments, Ltd.—Winding up voluntarily. Liquidator, Mr. L. W. Robson, Victoria Station House, Victoria Street, London, S.W.1. Particulars of claims to the liquidator by February 17th.

Bankruptcies

J. W. Watson, 154, Aldborough Road, Seven Kings, Essex, electrical engineer.—This debtor's application for his discharge was heard recently at Chelmsford. The receiving order was made in 1939, when the liabilities totalled £1,932. The debtor was now in employment, but he had intimated his willingness to pay 10s. a week for the next five years for the benefit of his creditors. The Judge granted the discharge on debtor's agreeing to judgment for £150 to be paid at the rate of £2 a month.

E. C. Ford, 16, Freehold, Whitchurch, Hants, electrician, formerly residing and carrying on business at Victoria Street, Basingstoke, electrical contractor.—Trustee, Mr. H. T. Jones, 12, Rolleston Street, Salisbury, Official Receiver, released February 16th, 1942.

J. H. Matthews, electrical dealer, 232, Town Street, Bramley, near Leeds.—Trustee, Mr. H. C. Bowling, 24, Bond Street, Leeds, Official Receiver, released May 30th, 1942.

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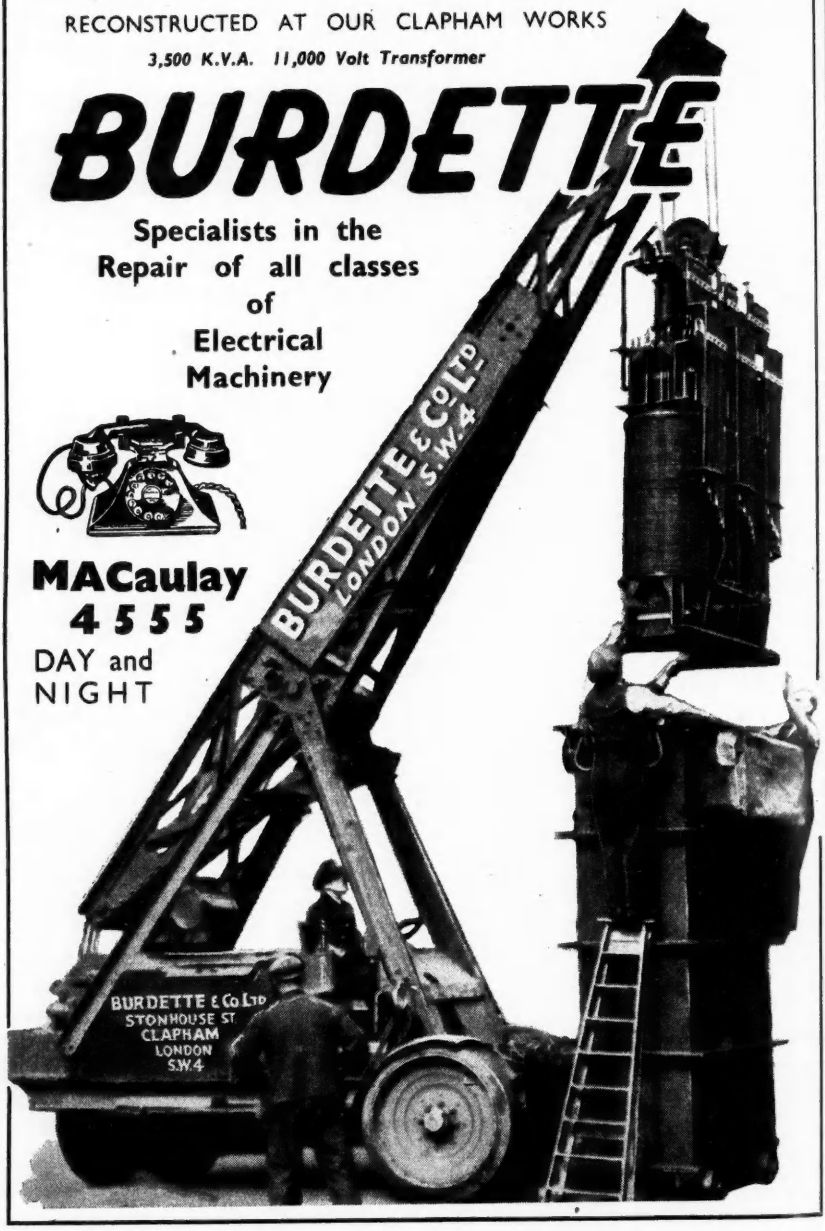
DAY and NIGHT



STOCKS AND SHARES

PREPARATIONS for the next big national campaign for the raising of war money are now in full swing. The "Wings for Victory Week" will be held in March, and the target of £150,000,000 that has been set for London's aim, is thought likely to be exceeded. These preparations may have something to do with the slight contraction of business that most of the Stock Exchange markets have experienced during the past business week. Prices are well held. Among gilt-edged securities, quotations are inclined to be better.

Front-rank industrial shares are as much wanted as ever. Occasional lines come to market. There is, for instance, at the present time, £50,000 Cable & Wireless ordinary stock that can be bought about 78. The yield is a little over 5 per cent. on the money. A few months ago, optimism talked of a possible increase in the 4 per cent. dividend, but it seems likely that this latter rate will be maintained for the duration of the war. Normally, a 5⅛ per cent. return from the ordinary stock of a commercial undertaking would not be considered particularly attractive but, in these times, 5 per cent. from a reasonably well-secured stock is looked upon as a fair rate to accept.

Home Railways

Public interest in Home Railway stocks has given signs of subsiding, in spite of the fact that the dividend season is close at hand. The threat of strike trouble is the latest red lamp waved across the path of the market regarded as an investment area. Prices, which came down on account of absence of buying, rallied upon a little expansion of demand. The prior-charge issues held their ground owing to the expectation that next month, and in March, a good deal of the money to be released by the operation of vesting orders, will be directed towards Home Railway senior stocks. Speculation is busier just now with industrial and mining shares than it is with Home Rails, but Transport "C" has shot up 3½ points to 60½, apparently on a hope that the forthcoming dividend announcement will show improvement upon last year's 27s. 8d. per cent.

Rises of Ten to One

With rises outnumbering falls in the proportion of ten to one—and there are about 50 of the former in our price-lists this week—there is no further need to stress the continued strength of markets. Commercial and industrial shares are in continual demand. Attention was recently drawn here to the higher yield offered by Henley's shares, as compared with Callender's and British Insulated. The reason, incidentally, was that 20,000 Henleys came to market from a deceased account. The shares were placed without any difficulty, and Henleys this week are $\frac{1}{16}$ up at 24s. 9d. for the 5s. shares. But the shares in both the two other companies have also advanced, Callender's being 1s. up at 78s. 9d. and "Wires" 1s. 3d. harder at 5 $\frac{3}{16}$. English Electrics at 48s. 6d. are 1s. 6d. to the good. Advances of $\frac{1}{16}$ have occurred in Siemens, Murex, Electric Construction, Walsall Conduits and Westinghouse Brake. Consolidated Signals are $\frac{1}{8}$ higher at 5¼. Ward & Goldstone rose 1s. 6d. to 22s. Brush ordinary at 7s. 3d., British Thermostat at 17s. 6d., and Tube Investments at 93s. 6d. are up 1s. apiece. Improvements of 6d. are too common throughout the list to warrant individual mention.

Telephone Shares Better

A rise of 25 has lifted British Electric Traction deferred to 1,100—200 points higher than it was six months ago. Thomas Tillings hardened to 52s. 9d. and Bristol Trams to 50s. 6d. Amongst foreign stocks, Mexican Light & Power firsts are 4 up, at 98½, and Rio 5 per cent. bonds at 103¼ have put on a point. Anglo-Portuguese Trams strengthened to 25s. The rises in Cable & Wireless are reflected in the small gains secured by Globe Telegraph ordinary and preference. Indian shares are once more a good market; Calcutta Electric and Madras Electric are better. Telephone descriptions keep good: a decline of 1s. to 39s. in Oriental Telephones makes the exception. Automatic Telephones, Hall Telephones, Telephone Properties, Rentals and Manufacturing all went forward. In a general advance of shares connected with the "heavy" industries, Vickers came to the fore with $\frac{1}{16}$ gain to 20s. 3d., while Babcocks at 51s. 3d. show a florin rise.

"Tel. & Tel."

International Telephone & Telegraph capital stock is in shares of no par value and the price has recently risen to 7, as duly noted in our lists. The shares are amongst those which can be sold in the London market, but not bought. In other words, if it is desired to take an interest in the company, the prospective buyer would have to carry out his wishes through a purchase in New York. On the other hand, deceased estates that contain International "Tel. & Tel." can be realised on the basis of the price already mentioned. Every now and then protest arises against the ban placed on dealings except in the matter of sales, but up to the present the Treasury has remained firm in its previous decision. The shares, like those of Shawinigan Water & Power,

(*Continued on page* 163)

ELECTRICAL INVESTMENTS

Prices, Dividends and Yields

Company	Dividend Previous	Dividend Last	Middle Price Jan. 26	Rise or Fall	Yield p.c. £ s. d.
Home Electricity Companies					
Bournemouth and Poole	12½	12½	58/–	..	4 6 0
British Power and Light	6	6	29/–	+6d.	4 2 9
City of London	7	7	31/6	..	4 9 0
Clyde Valley	8	8	41/6	+1/–	3 17 0
County of London	8	8	41/6	+6d.	3 17 0
Edmundson's:					
7% Pref.	7	7	34/–	..	4 2 4
Ord.	6	6	29/–	..	4 2 9
Elec. Dis. Yorkshire	9	9	43/6	..	4 3 9
Elec. Fin. and Securities	12½	12½	49/–	..	5 2 1
Elec. Supply Corporation	10	10	46/6	..	1 6 0
Isle of Thanet	2	Nil	16/–	..	—
Lancs. Light and Power	7½	7½	37/–	+6d.	4 1 1
Llanelly Elec.	5½	5½	22/6	..	4 17 9
Lond. Assoc. Electric	4½	4	24/–	..	3 6 8
London Electric	6	6	27/–	..	4 9 0
London Power Red. Deb.	5	5	101½	..	4 15 7
Metropolitan E.S.	8	8	41/–	+6d.	3 18 0
Midland Counties	8	8	41/–	+6d.	3 18 0
Mid. Elec. Power	9	9	44/–	..	4 1 9
Newcastle Elec.	7	7	31/–	+1/–	4 10 5
North Eastern Elec.					
Ordinary	7	7	33/–	..	4 4 10
7% Pref.	7	7	34/6	..	4 1 2
Northampton	10	10	47/6	..	4 4 0
Notting Hill 6% Pref. (£10)	6	Nil	9¾	..	—
Northmet Power:					
Ordinary	7	7	39/–	..	3 11 8
6% Pref.	6	6	31/6	..	3 16 2
Richmond Elec.	6	6	27/–	+6d.	—
Scottish Power	8	8	41/–	+6d.	3 18 0
Southern Areas	5	5	23/–	..	4 7 0
South London	7	7	26/–	..	—
West Devon	5	5	22/6	..	4 9 0
West Glos.	4½	3½	21/6	..	3 5 2
Yorkshire Elec.	8	8	41/–	..	3 18 0
Overseas Electricity Companies					
Atlas Elec.	Nil	Nil	5/–	+3d.	—
Calcutta Elec.	7*	7*	34/6	+1/–	—
Cawnpore Elec.	10	10	27/6	..	7 5 6
East African Power	7	7	30/–	..	4 13 4
Jerusalem Elec.	7	5	23/6	..	4 5 0
Kalgoorlie (10/–)	7½	5	9/–	–6d.	5 11 1
Madras Elec.	6*	4*	23/6	+6d.	—
Montreal Power	1½	1½	29½	+1½	5 1 8
Palestine Elec. "A"	Nil	4*	31/–	+1/–	2 11 8
Perak Hydro-elec.	6	7	9/6	+6d.	—
Shawinigan Power	83cts.	90cts.	19⅜	..	—
Tokyo Elec. 6%	6	6	20½	–1	—
Victoria Falls Power	15	15	78/9	..	3 16 4
Whitehall Inv. Pref.	5	5	20/–	..	5 0 0

Company	Dividend Previous	Dividend Last	Middle Price Jan. 26	Rise or Fall	Yield p.c. £ s. d.
Public Boards					
Central Electricity:					
1955-60 (Civil Defence)	—	3	100	..	3 0 0
1955-75	5	5	116	..	4 6 2
1951-73	4½	4½	108	+1	4 3 4
1963-93	3½	3½	103	..	3 8 0
1974-94	3¾	3¾	101	+1	3 4 4
London Elec. Trans. Ltd.	2½	2½	96½	..	2 11 10
London & Home Counties 1955-75	4½	4½	110	..	4 1 10
Lond. Pass. Trans.:					
A	4½	4½	121½	+2	3 12 1
B	5	5	123½	+1	4 1 6
C	3	2⅞	60½	+3½	4 15 0
West Midlands J.E.A. 1948-68	5	5	110	..	4 11 6
Telegraph and Telephone					
Anglo-Am. Tel.:					
Pref.	6	6	111½	..	5 7 7
Def.	1½	1½	28½	+1	5 5 3
Anglo-Portuguese	8	8	25/–	+6d.	6 8 0
Cable & Wireless:					
5½ Pref.	5½	5½	112	+1	4 18 1
Ord.	4	4	78	..	5 2 7
Canadian Marconi $1	Nil	4cts.	7/6	..	2 7 6
Globe Tel. & Tel.:					
Ord.	8¼*	5*	32/6	+1/–	3 1 6
Pref.	6	6	28/–	+6d.	4 5 9
Great Northern Tel.:					
(£10)	Nil	Nil	23	..	—
Inter. Tel. & Tel.	Nil	Nil	7	..	—
Marconi-Marine	7½	7½	31/6	..	4 15 3
Oriental Tel. Ord.	16	10	39/–	–6d.	—
Telephone Props.	6	Nil	13/9	+6d.	—
Tele. Rentals (5/–)	10	10	11/3	+6d.	4 9 0
Traction and Transport					
Anglo Arg. Trans.:					
First Pref. (£5)	Nil	Nil	5/–	..	—
4% Inc.	Nil	Nil	13	..	—
Brit. Elec. Traction:					
Def. Ord.	45	45	1100	+25	4 1 9
Pref. Ord.	8	8	170	..	4 14 2
Bristol Trams	8	10	50/6	+6d.	3 19 1
Brazil Traction	8½	8½	23½	+½	—
Calcutta Trams	8	5½	19/–	..	5 15 9
Cape Elec. Trams	5	5	22/6	–1/–	4 9 0
Lancs Transport	10	10	43/3	..	4 12 4
Mexican Light:					
1st Bonds	5	5	98½	+4	5 1 6
Rio 5% Bonds	5	5	103½	+1	4 16 6
Southern Rly.:					
5% Prefd.	5	5	77½	–1	6 9 5
5% Pref.	5	5	117½	–1	4 5 1
T. Tilling	10	10	52/9	+6d.	3 14 8
West Riding	10	10	39/6	+6d.	5 1 3

(*Continued on next page*)

*Dividends are paid free of Income Tax.

Company	Dividend Previous	Dividend Last	Middle Price Jan. 26	Rise or Fall	Yield p.c.
Equipment and Manufacturing					£ s. d.
Aron Elec. Ord. ..	7½	10	35/–	..	5 14 4
Assoc. Elec. :					
Ord.	10	10	49/6	+6d.	4 1 0
Pref.	8	8	39/–	..	4 2 0
AutomaticTel.&El.	12½	12½	55/6	+6d.	4 10 0
Babcock & Wilcox	11	11	51/3	+2/–	4 5 9
British Aluminium	10	10	50/–	+6d.	4 0 0
British Insul. Ord.	20	20	5 3/8	+1/8	3 17 3
British Thermostat (5/–)	18½	18½	17/6	+1/–	5 5 9
British Vac. Cleaner (5/–)	10	15	21/6	..	3 9 9
Brush Ord. (5/–)	Nil	6	7/3	+1/–	4 2 9
Callender's ..	15	15	78/9	+1/–	3 16 0
ChlorideElec.Storage	15	15	76/3	..	3 18 9
Cole, E. K. (5/–)	7	10	21/3	..	2 7 0
Consolidated Signal	17	17	102/6	+1/2	3 6 5
Crabtree (10/–) ..	17½	17½	38/6	+6d.	4 11 0
Crompton Parkinson Ord. (5/–) ..	30	20	26/–	–6d.	3 17 0
E.M.I. (10/–) ..	6	6	21/6	+6d.	2 15 9
Elec. Construction	10	10	41/3	+1/4	4 14 1
Enfield Cable Ord.	12½	12½	59/6	+6d.	4 4 0
Elecl. Switchgear (10/–)	10	10	20/–	..	5 0 0
English Electric ..	10	10	48/6	+1/6	4 2 3
Ensign Lamps(5/–)	25	25	17/6	..	7 2 10
Ericsson Tel. (5/–)	22*	20*	46/3	..	2 6 9
Ever Ready (5/–)	40	40	39/–	..	5 2 7
Falk Stadelmann	7½	7½	26/–	..	5 15 5
Ferranti Pref. ..	7	7	28/9	..	4 17 5
G.E.C. :					
Pref.	6½	6½	33/3	..	3 18 4
Ord.	20	17½	86/6	+6d.	4 1 0
Greenwood & Batley	15	15	36/–xd	+6d.	8 6 8
HallTelephone(10/–)	10	12½	23/9	+6d.	5 5 3
Henley's (5/–) ..	20	20	24/9	+1/4	4 1 0
4½% Pref. ..	4½	4½	23/–	..	3 18 3
Hopkinsons ..	15	15	57/–	+6d.	5 5 3
India Rubber Pref.	5½	5½	20/–	..	5 10 0
Intl. Combustion	32½	30	6	..	5 0 0
Johnson & Phillips	15	15	63/6	..	4 14 4
Lancashire Dynamo	20	20	78/9	..	5 1 8
Laurence,Scott(5/–)	15	12½	10/–	..	6 5 0
London Elec. Wire	7½	7½	30/–	..	5 0 0
Lucas, J.	15	15	71/3	–1/4	4 4 3
Mather & Platt ..	10	10	48/3	..	4 3 2
Met.Elec.CablePref.	5½	5½	21/3	..	5 3 6
Murex	20	20	5 5/8	+1/4	3 15 0
Pye Deferred (5/–)	25	25	21/3	..	5 17 8
Revo (10/–) ..	20	17½	35/6	..	4 18 7
Reyrolle	12½	12½	64/6	..	3 17 6
Siemens Ord. ..	7½	7½	30/6	+1/4	4 18 4
Smith, S. (1/–) ..	50	37½	8/9	..	4 5 9
Strand Elec. (5/–)	4	7½	5/9	..	6 10 4
Switchgear & Cowans (5/–) ..	15	10	12/6	..	4 0 0
T.C.C. (10/–) ..	5	5	15/–	..	3 6 8
T.C. & M... ..	10	10	47/6	..	4 4 2
Telephone Mfg.(5/–)	9	9	11/6	+6d.	3 18 3
Thorn Elec. (5/–)	20	20	19/–	..	5 5 3
Tube Investments	23¾	20	93/6	+1/–	4 5 7
Vactric (5/–) ..	Nil	Nil	10/–	+9d.	—
Vickers (10/–) ..	10	10	20/3	+1/4	4 18 9
Ward & Goldstone (5/–)	20	20	22/–	+1/6	4 11 0
Westinghouse Brake	10	12½	62/6	+1/4	4 0 7
WalsallConduits(4/-)	55	55	42/6	+1/4	5 3 6
West, Allen (5/–)	7½	7½	6/6	..	5 15 5

* Dividends are paid free of Income Tax.

Stocks & Shares (*Continued from page* 161)

Montreal Light & Power and various others can be sold, but not bought, in the London Stock Exchange.

Radio Speculation

Speculation in the shares of the radio manufacturing companies has noticeably slackened since it sprang into activity early this month. The substantial rises which have occurred in Electrical & Musical Industries, E. K. Cole, A. C. Cossor, Philco, and others connected with this group, attracted attention from those people who are never satisfied unless they happen to be interested in the speculative favourite of the moment. The demand came upon a market where there was no large floating supply, and it had an effect disproportionate to the amount of actual business transacted. Cool consideration of the yields that can be obtained from the shares at the present prices, served to check the buoyancy of the market and, as already noted, the mild excitement has subsided. Nevertheless, prices keep very firm, and quotations are well above those from which the rise started. The supporter of the movement in these shares refers airily to post-war prospects as sufficient justification for the present values.

Electricity Supply Shares

The Scottish and the provincial companies' shares are the chief scorers in the current price-lists. Of the London shares, County of London, Metropolitan & Richmond ordinary are better. British Light & Power gained a further 6d. at 29s. More than a dozen of the preference issues show improvements on the week. These are some of the prices, not quoted in our lists, that have just been advanced :—

Preference.	Divd.	Price. s. d.	Yield. £ s. d.
County of London ..	4	21 6	3 14 5
Elec. Dis. Yorkshire..	6	31 0	3 17 5
Mid. Cheshire ..	4	20 6	3 18 1
Midland Counties ..	6	31 6	3 16 2
North Met.	4	21 6	3 14 5
Scottish	4	21 6	3 14 5
Do.	6	32 0	3 15 0
West Devon	6	25 6	4 14 1
Yorkshire	6	32 0	3 15 0

General Electric 7½ per cent. " B " preference have risen to 37s. 3d.

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (1s. each) may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2. The superseded application numbers are omitted except where specifications have been advertised in the Journal under those numbers as open to public inspection under Sec. 91 (4) *of the Patents Acts.*

ABBEY (Wilson Welder & Metals Co., Inc.).—" Variable reactance transformers." July 3rd, 1941. (550422.)

Aktiebolaget Elektrolux.—" Absorption refrigerating apparatus." 5518/42. May 8th, 1941. (550474.)

Babcock & Wilcox, Ltd.—" Apparatus for cleaning fluid heaters such as boilers." 8259/41. August 14th, 1940. (550355.)

British Thomson-Houston Co., Ltd.—" Reactors or like electric induction apparatus." 13879/41. October 30th, 1940. (550374.) " Vapour lamps." 13966/41. November 2nd, 1940. (550375.) " Washing machines." 11886/41. September 19th, 1940. (550440.) " Electric valve control circuits." 8262/41. July 5th, 1940. (550451.) " Refrigerators." 1176/42. January 29th, 1941. (550471.)

British Thomson-Houston Co., Ltd., and P. D. Morris. " Control devices for superchargers." July 23rd, 1941. (550428.)

British Thomson-Houston Co., Ltd., and C. J. Morton.—" Methods of and apparatus for manufacturing commutators for small dynamo-electric machines." September 2nd, 1941. (550359.)

British Thomson-Houston Co., Ltd., and A. S. Vause.—" Electrodes for electric discharge lamps and the like." September 25th, 1941. (550366.)

Drayton Regulator & Instrument Co., Ltd., and R. V. Grover.—" Automatic control apparatus for temperature, fluid pressure or humidity." February 27th, 1942. (550472.)

Dubilier Condenser Co. (1925), Ltd. (W. Dubilier).—" Electrical condensers and the manufacture thereof." 8275/41. July 1st,1941. (Convention date not granted). (550419.) " Electrical condensers and the manufacture thereof." 15476/42. July 1st, 1941. (Convention date not granted.) (550502.)

Electric Construction Co., Ltd., and E. Gledhill.—" Electric motor control systems." January 22nd, 1942. (550387.)

Frosted Foods, Ltd. (General Foods Corporation).—" Refrigerating apparatus." July 2nd, 1941. (550487.)

Hoover, Ltd.—" Suction cleaners." 8454/41. July 5th, 1940. (550423.)

Landis & Gyr Akt.-Ges.—" Means for the remote control of apparatus through a separate control line." 20978/39. March 9th, 1939. (550353.)

Landis & Gyr Soc. Anon.—" Coin-inlet mechanism for use on prepayment apparatus, more especially for electricity or gas." 8192/41. July 13th, 1940. (550395.)

H. G. McClean, and Crompton Parkinson, Ltd.—" Electric power generating plant and vehicles incorporating such plant." October 7th, 1941. (550372.)

Marconi's Wireless Telegraph Co., Ltd.—"Transmission of pictures." 14048/41. November 1st, 1940. (550376.)

Marconi's Wireless Telegraph Co., Ltd., and C. P Fagan.—" Insulators in electric discharge tubes, especially in such tubes for maintaining a voltage constant." July 7th, 1941. (550497.)

R. N. Mirza and F. J. Allen.—" Electrical indicating and remote-control apparatus." July 4th, 1941. (550426.)

Morphy-Richards, Ltd., and D. W. Morphy.—" Electrical resistance heating elements." August 21st, 1941. (550433.)

Philips Lamps, Ltd. (Naamlooze Vennootschap Philips' Gloeilampenfabrieken).—" Microphones." September 9th, 1941. (550362.) " Electric discharge tubes." September 4th, 1941. (550435.)

R. A. Rothermel, Ltd., F. S. S. Wates, International Marine Radio Co., Ltd., and W. H. McAllister.—" Wireless signalling devices." August 15th, 1941. (550430.)

Standard Telephones & Cables, Ltd.—" Circuits for grid-controlled gas-filled electron tubes." 11371/41. September 7th, 1940. (550405.) " Carrier transmission systems." 4181/42. October 24th, 1940. (550473.)

A. H. Stevens (H. A. Furman).—" Electrodes for voltaic cells." January 6th, 1941. (550444.)

Svenska Aktiebolaget Gas-Accumulator.—" Methods and apparatus for welding by electric discharges." 5348/40. March 23rd, 1939. (550384.)

J. S. Thatcher.—" Electric clocks." September 9th, 1941. (550361).

Western Electric Co., Inc.—" Vacuum tube amplifiers." 16474/41. December 21st, 1940. (550468.)

Western Electric Co., Ltd. (Western Electric Co., Inc.).—" Electric signalling systems." 16279/41. December 17th, 1941. (Convention date not granted.) (550409.)

Westinghouse Electric International Co.—" Treatment of carbon bodies to improve the hardness, density, and electrical conductivity thereof." 15015/41. November 23rd, 1940. (550379.)

E.A.W. Activities

THE annual general meeting of the E.A.W. Business and Professional Women's Circle is to be held on Monday, February 1st, at 20, Regent Street, S.W.1. The meeting begins at 6 p.m. and will be followed by a discussion on the Beveridge Report to be opened by Miss A. Lockhart.

The London Branch of the E.A.W. is holding its annual general meeting on February 23rd at noon.

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

Contracts Open

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses.

Australia.—NEW SOUTH WALES.—Sydney County Council. March 25th. 22-kV metal-clad neutral switching equipment (Spec. 610).

June 24th. Steam generating plant for Pyrmont power station, section B. (Spec. 650).

July 8th. 50,000-kW steam turbo-alternator set for Pyrmont (Spec. 651).

VICTORIA.—State Electricity Commission. March 3rd. 132- and 66-kV outdoor switchgear and accessories (Spec. 42-43/42).

April 14th. Compound-filled 22-kV switchgear with all accessories (Spec. 42-43/41).

COMMONWEALTH. — P.M.G.'s Department. February 22nd. Induction coils (Sch. C.3990).

March 4th. Braided switchboard cable (Sch. C.4013).

Birkenhead.—February 15th. Electricity Department. Electric lamps. (See this issue.)

Bootle.—January 30th. Borough Council. Electric lamps (Form No. 14). Forms of tender, etc., from W. A. Harrison, borough engineer, Town Hall.

Liverpool.—February 8th. Electric Supply Department. Six 250-kVA transformers. (See this issue.)

Tottenham.—February 12th. Borough Council. Electric lamps (Schedule No. 20). Forms of tender on application to E. Townson, town clerk, Town Hall.

Orders Placed

Glasgow.—Corporation Gas Committee. Accepted. Lighting installation plant at gas-works (£400).—Electricity Department.

Northumberland. — Education Committee. Accepted. Electrical installation at Blagdon cooking depot.—Gray Bros. Electrical installation at Ponteland depot.—A. McLean Brown.

Swansea.—Electricity Committee. Accepted. Fire protection equipment (£662).—Mather & Platt.

Contracts in Prospect

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Ardwick.—Additions to garage, Viaduct Street and Alderman Street ; P. Darlington & Sons, carriers, 137, Hillkirk Street.

Ashton-under-Lyne.—Houses ; A. L. Kemp, borough surveyor, Municipal Offices, Warrington Street.

Atherton.—Houses ; F. L. Boydell, surveyor, Town Hall.

Bedford.—Nursery, Pearcey Road (£1,798) ; Warton & Goodship.

Blyth.—Bus station ; United Automobile Services, Ltd., Darlington.

Burnage.—Catholic church ; W. Ellis, architect, Union Bank Chambers, Hardshaw Street, St. Helens.

Cheshire.—Buildings ; Bethell & Sons, Ltd., builders, Dane Road, Sale.

Dalbeattie.—Adaptation of church as dining centre for 300 pupils, with club rooms, etc., for Kirkcudbrightshire Education Committee ; county clerk, Castle Douglas.

Darlington.—Wartime nursery, North Road ; borough engineer.

Edmonton.—Large huts for clinic purposes, Pymmes Park ; borough engineer, Edmonton Town Hall, N.9.

Felling-on-Tyne.—Canteen, Heworth Colliery ; Miners' Welfare Committee, London, S.W.1.

Flixton.—Rebuilding factory after fire ; Pybus Bros., Ltd., candle makers, Woodsend Road.

Gateshead.—Canteen, Team Valley Estate ; J. H. Napper, architect, King's College, Newcastle-on-Tyne.

Gillingham.—Hut (100 children) ; borough engineer.

Glasgow.—Cooking centres at schools ; city architect.

Gorton.—Works extensions ; H. Matthews & Sons, builders, 129, Stockport Road, Ardwick, Manchester, 12.

Great Yarmouth.—Library extensions ; F. Conway, town clerk.

Irlam.—British Restaurant and kitchen ; H. Nurse, surveyor, Council Offices.

Hasbury.—Fire station (£2,564) ; J. Harper & Sons (Blackheath), Ltd., building contractors, Blackheath, *via* Birmingham.

Huntingdon.—Dwellings (24) for agricultural workers ; War Agricultural Executive Committee.

Leigh.—Milk distribution warehouse, Gas Street ; Leigh Friendly Co-operative Society, Ltd.

Store, Pownall Street ; Sutcliffe Speakman & Co., Ltd.

Levenshulme.—Additions to garage, Burnage Lane, Jaff Engineering Co. ; W. C. Coulson, architect, 29, Westhulme Road, Withington, Manchester, 20.

Lichfield.—Proposed completion of 34 houses, Ponesfield site ; borough engineer.

London. — FULHAM. — Nursery, Bramber Road ; borough engineer.

ISLINGTON. — Nursery, Windsor Road ; borough engineer.

Lowestoft. — Workshop, Kendal Road ; Chromglaze, Ltd.

Manchester.—Works additions; W. Campbell, architect, 44, Altrincham Road, Gatley, Cheshire Additions, paint works, Cornbrook; D. MacPherson & Co., Ltd., Albion Street, Gaythorn, Manchester, 1.

Day nursery, Collyhurst (£3,100); G. Noel Hill, city architect, Town Hall, Albert Square, Manchester.

Mansfield.—Joint school clinic and maternity and child welfare centre; Waude Thompson, borough surveyor, Municipal Buildings.

Middleton.—Works canteen, Oldham Road; Bradshaw Gass & Hope, architects, Bolton.

Morpeth.—Conversion of Corn Exchange into British Restaurant; F. K. Perkins, borough engineer.

Murton.—Miners' canteen; G. Gradon & Sons, North Road, Durham.

Newcastle-under-Lyme.—Stores, central site; Debenham's, Ltd., 2, Welbeck Street, London, W.1.

Newcastle-on-Tyne.—Tyre control depot, St. Mary's Place, for H. Young (Motors), Ltd.

Oldham.—Church of St. Ambrose; Rev. F. P. Royle, the Vicarage, Watersheddings, Waterhead, Oldham.

Oxfordshire.—Alterations at Grammar School, Burford (£1300); county architect, 3, Becket Street, Oxford.

Rowley Regis.—British Restaurant, Blackheath (£1,899); L. G. Taylor, borough surveyor, Municipal Buildings, Old Hill, Staffs.

Sheffield. — Additions, Hallam Lane; Warrington's Transports, Ltd., 80/88, Eyre Lane.

Shrewsbury.—Hotel; Lawley's, Ltd., china and glass dealers, Kingley Street, London, W.1.

South Shields.—Canteen for the Middle Docks & Engineering Co., Ltd.; Gustave's Bailey, Ltd., 19, King Street.

Stanhope.—Headquarters and accommodation for National Fire Service personnel; Divisional Officer Symonds.

Stockton-on-Tees.—Temporary offices; Ashmore, Benson Pease & Co., Bowesfield Lane.

Temporary milk bottling shop, Albion Street; H. C. Garbutt, architect, 18, Albert Road, Middlesbrough.

Sunderland.—Hospital additions; borough engineer.

Twickenham.—Erection of nursery, grounds of old Hampton Grammar School, Oldfield Road; borough engineer, Municipal Offices, Twickenham.

Urmston.—Office extensions, Urmston; J. A. Webster & Co., Ltd., Richmond Road.

Walton and Weybridge.—Erection of British Restaurant; U.D.C. surveyor, Council Offices, Hersham Road, Walton-on-Thames.

West Hartlepool.—Additional school accommodation, Seaton; F. Durkin, borough engineer.

West Riding.—Extensions to county hospitals for maternity wards; A. Booth, county architect, County Hall, Wakefield.

Wisbech.—Erection of cubicle block and laundry at Isolation Hospital; Wisbech Joint Isolation Hospital Board.

FORTHCOMING EVENTS

Institution of Electrical Engineers (see also I.E.E. Meetings).—*London Students' Section.*—Monday, February 1st, 7 p.m. Address by the President, Prof. C. L. Fortescue, on "The Relation between Subsequent Career and the Form of Preliminary Training."

South Midland Centre.—Monday, February 1st, 6 p.m. James Watt Institute, Birmingham. Paper: "Standardisation as applied to Industrial Electrical Instruments," by Lieut.-Col. Edgcumbe, T.D.

North Midland Students' Section.—Saturday, February 6th, 2.30 p.m. Griffin Hotel, Leeds. Address by the Centre chairman, Mr. W. Fordham Cooper.

Western Centre.—Monday, February, 8th, Cardiff. Paper: "Coal for Steam Raising," by Mr. J. N. Waite.

North-Eastern Centre.—Monday, February 8th, 6.15 p.m. Neville Hall, Westgate Road, Newcastle-on-Tyne. Paper: "A Survey of Electrical Sheet Steels for Power Plant and the Factors affecting their Magnetic Properties," by Dr. F. Brailsford.

Junior Institution of Engineers.—Saturday, February 6th, 2.30 p.m., Manchester Geographical Society, 16, St. Mary's Parsonage, Manchester. N.W. Section annual meeting and talk on "Works Accidents," by Mr. G. E. Windeler.

Institute of Welding.—Wednesday, February 3rd, 6 p.m. Institution of Mechanical Engineers, Storey's Gate, London, S.W.1. Series of papers on developments in arc welding technique:—"Unionmelt Welding," Mr. R. R. Sillifant; "The Murex Deck Welder," Mr. H. Martin; "Lincoln Fleet Fillet Technique," Mr. R. L. Swan; "The Fusarc Automatic Deck Welder," Mr. H. J. Stretton; and "Fire Cracker Welding and the Weibel Process and Elin Automatic Welder," Mr. J. H. Paterson.

TRADE MARK APPLICATIONS

THE following applications have been made for British trade marks. Objections may be entered within a month from January 20th:—

ELCO (design). No. B.615122, Class 9. Electric soldering irons.—Elco (Treforest), Ltd., Treforest Trading Estate, near Cardiff.

CONGLASS. No. 620905, Class 9. Glass-covered electric wires and cables. Also CONYMEL. No. 620906, Class 9. Electric wires and cables.—Connolly's (Blackley), Ltd., Blackley Vale Mills, Blackley, Manchester.

LATEM. No. 620618, Class 11. Refrigerators, radiators, stoves, immersion heaters and cookers, all being electrical goods.—The Bradford Metal Case Co., Ltd., also trading as Latem Electrical Co., Eastwood Works, Hall Lane, Bradford.

INSUL-JABROC. No. 620842, Class 17. Resin-covered or resin-bonded fibrous materials for insulating purposes.—Moulded Components (Jablo), Ltd., Mill Lane, Waddon, Croydon.

INFRAY. No. 621242, Class 17. Insulating varnish and insulating materials.—Pinchin, Johnson & Co., Ltd., 4, Carlton Gardens, London, S.W.1.